

UT ROCKY RIVER STREAM RESTORATION – NCEEP Project #402
2011 FINAL MONITORING REPORT – YEAR 5

CONDUCTED FOR THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES



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Environment and Natural Resources
Ecosystem Enhancement Program
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1.0 Executive Summary

The goals of the UT Rocky River Stream Restoration Project are to:

- Improve water quality and reduce erosion through restricting cattle access and improved riparian buffers;
- Improve aquatic habitat using natural material stabilization structures; and
- Provide aesthetic value, wildlife habitat, and bank stability through restoration/enhancement of the riparian zone.

The objectives for this restoration are to:

- Exclude cattle from Reach 1;
- Enhance approximately 150 feet of Reach 1 and stabilize an additional 955 feet of the same reach;
- Reconnect Reach 2 to its floodplain;
- Provide a stable channel for both reaches in terms of pattern, profile, and dimension; and
- Provide a conservation easement and enhance/restore portions of the buffer for both reaches.

The average live planted woody stem density (472 live stems per acre) has exceeded the vegetation success criteria (260 live stems per acre in Year 5) by 81 percent. Planted vegetation survival in the two vegetation plots in Reach 1 do not meet the success criteria, however planted stem density along Reach 1 has increased due to a supplemental planting along the left bank of Reach 1 on March 11, 2011. A total of 145 stems were planted. Additional details about this planting can be found in Appendix C. Three sections along Reach 2 qualify for riparian buffer credit. Planted stem density in these areas exceeds the required 320 stems/acre. Invasive exotics were treated throughout the conservation easement in the summer of 2010 and 2011.

Overall, the restoration project appears to have met morphological goals. The enhanced sections of Reach 1 are stable. Flowing water was present in the Reach 2 channel during the initial 2011 assessment conducted, but there was no flow during the August 2011 site visits. The lack of flow during the summer and fall assessments in 2011 corresponds with similar findings in 2007 through 2010. The overgrown channel hampered visual assessment, but overall the channel appears to be stable.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the mitigation and restoration plan documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

2.0 Methodology

Monitoring methodologies follow the current EEP-provided templates and guidelines (Lee *et al* 2006). Photographs were taken digitally. A Trimble Geo XT handheld mapping-grade unit was used to collect cross section, vegetation corner, photopoint, and problem area locations. All problem areas identified on the spring 2011 versions of the CCPV were re-evaluated.

2.1 Stream Methodology

Methods employed were a combination of those specified in the Mitigation Plan, the First Annual Monitoring Report, and standard regulatory guidance and procedures documents. Stream monitoring data was collected using the techniques described in USACE *Stream Mitigation Guidelines*, US Forest Service's *Stream Channel Reference Sites*, and *Applied River Morphology* (USACE, 2003; Harrelson et al., 1994; Rosgen, 1996). A South Total Station and Nikon automatic level were used for collecting all geomorphic data. Photographs facing upstream were taken at each cross section.

2.2 Vegetation Methodology

A total of six representative vegetation survey plots were selected and installed in the Reaches 1 and 2 by Ward Engineering in 2007. All plots measure 100 square meters in area and are five meters by 20 meters. Pursuant to the guidelines, the four corners of each plot (0,0; 0,20; 5,0; and 5,20.) are marked with metal pipe.

Level 1 (planted woody stems) and Level 2 (volunteer woody stems) data collection was performed in all plots, pursuant to the most recent CVS/EEP protocol (Lee *et al* 2006). Within each plot, each planted woody stem location (x and y) was recorded, and height and live stem diameter were recorded for each stem location. All planted stems were identified with pink flagging. Vegetation was identified using Weakley (Weakley 2007). Photos were taken of each vegetation plot from the 0,0 corner.

3.0 References

- Harrelson, Cheryl, C. L. Rawlins, and John Potpondy. (1994). *Stream Channel Reference Sites: An Illustrated Guide to Field Technique*. USDA, Forest Service. General Technical Report RM-245.
- Lee, Michael T., Peet, Robert K., Roberts, Steven D., Wentworth, Thomas R. (2006). *CVS-EEP Protocol for Recording Vegetation Version 4.0*. Retrieved October 30, 2006, from: <http://www.nceep.net/business/monitoring/veg/datasheets.htm>.
- Radford, A.E., H.E. Ahles, and C.R. Bell (1968). *Manual of the Vascular Flora of the Carolinas*. University of North Carolina Press. Chapel Hill, NC.
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- Rosgen, DL. (1997). "A Geomorphological Approach to Restoration of Incised Rivers. In *Proceedings of the Conference on Management of Landscapes Disturbed by Channel Incision*, ed. S.S.Y. Wang, E.J. Langendoen and F.B. Shields, Jr. University of Mississippi Press, Oxford, MS.
- USACOE (2003) *Stream Mitigation Guidelines*. USACOE, USEPA, NCWRC, NCDENR-DWQ
- Ward Consulting Engineering (2007). *UT to Rocky River (Smith Tract) Stream and Buffer Restoration, Enhancement, and Preservation, Chatham County, North Carolina Mitigation Report*. March 20, 2007.
- Ward Consulting Engineering (2008). *UT to Rocky River (Smith Tract) Stream and Buffer Restoration, Enhancement, and Preservation, Chatham County, North Carolina Final Monitoring Report*. February 15, 2008.
- Weakley, Alan (2007). *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas*. Retrieved March 27, 2007 from: <http://www.herbarium.unc.edu/flora.htm>.

Appendix A. Project Vicinity Map and Background Tables

Figure 1.0.	Project Vicinity Map and Directions
Table 1.0	Project Restoration Components
Figure 1.1	Buffer Mitigation Credits
Table 2.0	Project Activity and Reporting History
Table 3.0	Project Contacts Table
Table 4.0	Project Attribute Table

UT Rocky River Stream Restoration (EEP Project #402)

Appendix A. Figure 1. Vicinity Map.

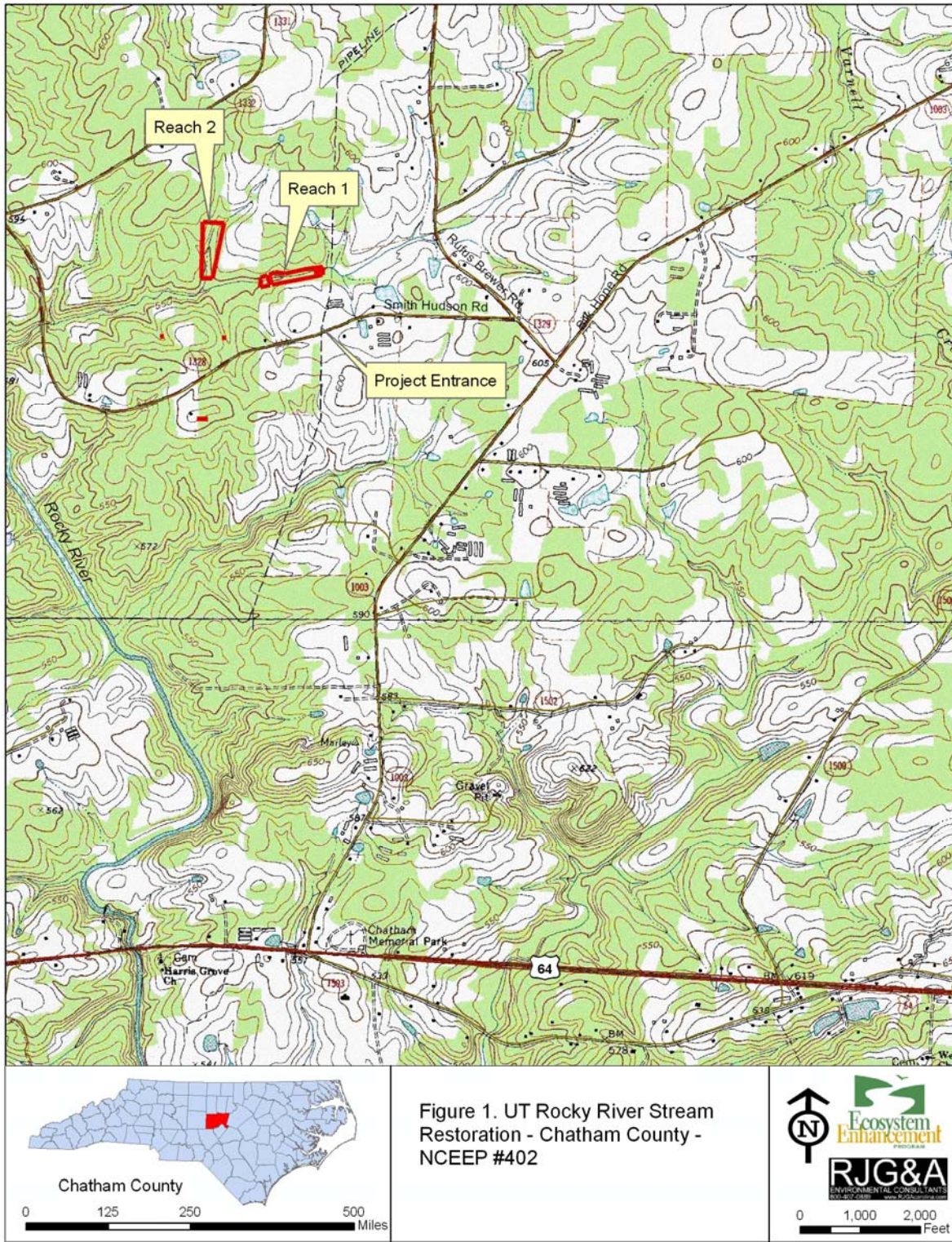


Table 1. Project Components and Mitigation Credits
 UT to Rocky River Stream Restoration – EEP Project #402

Mitigation Credits									
Type	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset
	R	RE	R	RE	R	RE			
Totals	1111	443	0	0	0	0	0.17	0	0

Project Components						
Project Component or Reach ID	Stationing/Location	Existing Footage/Acreage	Approach (PI, PII, etc.)	Restoration or Restoration Equivalent	Restoration Footage or Acreage ¹	Mitigation Ratio
Reach I	00+00-00+47; 00+107-08+87	827	SS	EII	827 LF	2.5:1
Reach i	08+87-9+10; 9+50-10+95	U	P1	EI	168 LF	1.5:1
Reach 2	00+00 - 11+11	U	P1	R	1,111 LF	1:1
Reach 2	00+00 - 11+11	0.17		R	0.17 AC	1:1

Component Summations						
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-Riparian (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	1111				7405	
Enhancement						
Enhancement I	168					
Enhancement II	827					
Creation						
Preservation						
HQ Preservation						

BMP Elements ²			
Element	Location	Purpose/Function	Notes

1 = In 2010 numbers were adjusted to exclude all ford crossings and bridges. Any differences in asset numbers between the 2011 report and earlier reports are due to this adjustment.

2 = BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; Grassed Swale = S; LS = Level Spreader; NI = Natural Infiltration Area, O = Other; CF = Cattle Fencing; WS = Watering System; CH = Livestock Housing

**Table 2. Project Activity and Reporting History
UT to Rocky River Stream Restoration – EEP Project #402**

**Elapsed Time Since Grading Complete: 4 yrs 11 months
Elapsed Time Since Planting Complete: 4 yrs 9 Months
Number of Reporting Years¹: 5**

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Restoration Plan	2003	Apr-05
Final Design – 90%	NA	--
Construction	NA	Oct-06
Temporary S&E mix applied	NA	July 2006 (R1); Sept 2006 (R2)
Permanent seed mix applied	NA	July 2006 (R1); Sept 2006 (R2)
Bare Root Planting	NA	Dec-06
Mitigation Plan/As-built	--	Mar-07
Year 1 Monitoring		Dec-07
Qualitative Evaluation	Nov-07	
Vegetation	Nov-10	
Geomorphologic	Nov-07	
Year 2 Monitoring		Nov-08
Qualitative Evaluation	Oct-08	
Vegetation	Oct-08	
Geomorphologic	Oct-08	
Year 3 Monitoring		Nov-09
Qualitative Evaluation	Oct-09	
Vegetation	Oct-09	
Geomorphologic	Oct-09	
Year 4 Monitoring		Oct-10
Qualitative Evaluation	Oct-10	
Vegetation	Aug-10	
Geomorphologic	Aug-10	
Year 5 Monitoring		Sep-11
Qualitative Evaluation	Aug-11	
Vegetation	Aug-11	
Geomorphologic	Aug-11	

Bolded items are examples of those items that are not standard, but may come up and should be included. Non-bolded items represent events that are standard components over the course of a typical project. part of this exhibit.

If planting and morphology are on split monitoring schedules that should be made clear in the table

1 = Equals the number of reports or data points produced excluding the baseline

Appendix A.

Table 3. Project Contacts Table UT to Rocky River Stream Restoration – EEP Project #402	
Designer Primary project design POC	Ward Consulting Engineers 8386 Six Forks Road, Suite 101 Raleigh, NC 27615-5088 Becky Ward (919) 870-0526
Construction Contractor Construction contractor POC	McQueen Construction 619 Patrick Road Bahama, NC 27503 Harvey McQueen (919) 697-0614
Survey Contractor Survey contractor POC	NA NA
Planting Contractor Planting contractor POC	Southern Garden Inc. P.O. Box 808 Apex, NC 27502 NA (919) 362-1050
Seeding Contractor Contractor point of contact	McQueen Construction 619 Patrick Road Bahama, NC 27503 Harvey McQueen (919) 697-0614
Seed Mix Sources	Evergreen Seed (919) 567-1333
Nursery Stock Suppliers	Coastal Plain Conserv. Nursery, Inc. (Edenton, NC) Ellen Colodney (252) 482-5707 Cure Nursery (Pittsboro, NC) Bill and Jennifer Cure (919) 542-6186 Brook Run Nursery (Blackstone, VA) Howard Malinski (919) 422-8727
Monitoring Performers Stream Monitoring POC Vegetation Monitoring POC Wetland Monitoring POC	Robert J. Goldstein & Associates 1221 Corporation Parkway, Raleigh NC 27610 Sean Doig, (919) 872-1174 Sean Doig, (919) 872-1174 NA

Table 4. Project Attribute Table		
UT to Rocky River Stream Restoration – EEP Project #402		
Project County	Chatham	
Physiographic Region	Piedmont	
Ecoregion	45c Carolina Slate Belt	
Project River Basin	Cape Fear	
USGS HUC for Project (14 digit)	3030003070020	
NCDWQ Sub-basin for Project	03-06-12	
Within extent of EEP Watershed Plan?	No	
WRC Hab Class (Warm, Cool, Cold)	Warm	
% of project easement fenced or demarcated	100%	
Beaver activity observed during design phase?	NA	
Restoration Component Attribute Table		
	Reach 1	Reach 2
Drainage area	1.28	0.21
Stream order	Second	First
Restored length (feet)	1095	1111
Perennial or Intermittent	Perennial	Intermittent
Watershed type (Rural, Urban, Developing etc.)	Rural	Rural
Watershed LULC Distribution (e.g.)	-	-
Residential	-	-
Ag-Row Crop	-	-
Ag-Livestock	-	-
Forested	-	-
Etc.	-	-
Watershed impervious cover (%)	2%	1%
NCDWQ AU/Index number	17-43-9	17-43-9
NCDWQ classification	C	C
303d listed?	No	No
Upstream of a 303d listed segment?	No	No
Reasons for 303d listing or stressor	NA	NA
Total acreage of easement	5.68	3.42
Total vegetated acreage within the easement	-	-
Total planted acreage as part of the restoration	-	-
Rosgen classification of pre-existing	C4/E4	G4
Rosgen classification of As-built ¹	C4/E4	C4
Valley type	-	-
Valley slope	0.012	0.012
Valley side slope range (e.g. 2-3.%)	-	-
Valley toe slope range (e.g. 2-3.%)	-	-
Cowardin classification	NA	NA
Trout waters designation	No	No
Species of concern, endangered etc.? (Y/N)	No	No

Appendix A.

Table 4. Project Attribute Table UT to Rocky River Stream Restoration – EEP Project #402		
Dominant soil series and characteristics	Cid-Lignum Complex 2-6% slopes	Nanford-Badin Complex, 2-6% slopes
Series	Cid-Nanford-Lignum	Cid-Nanford-Lignum
Depth	0-80	0-80
Clay%	10-55%	2-35%
K	.24-.55	.43-.64
T	2-4	4

Appendix B. Visual Assessment Data

Figure 2.0.-2.2	Current Conditions Plan View
Table 5.0-5.1	Visual Morphological Stability Assessment
Table 6.0	Vegetation Condition Assessment Table
Figure 3.0-3.4	Stream Station Photos
Figures 4.0-4.1	Vegetation Monitoring Plot Photos

Reach 1	Northing	Easting
Cross-section end point		
1A	733824.106	1876704.110
1B	733887.867	1876667.219
Vegetation plot (0,0) corners		
1	733921.773	1877367.424
2	733786.687	1876587.837



Figure 2.0. Current Conditions Plan View - Reach 1. Rocky River. Chatham County. NCEP Project #402

— As-built Thalweg # Photopoints
— Thalweg Monitoring Year 5 (8/3/2011)

As-Built Data (Supplied by Ward Engineering)

Conservation Easement — Cross-Section
 Cross Vane Vegetation Monitoring Plot
— Top of Bank

0 50 100 200 300
 Feet
 1 inch equals 100 feet



Reach 2	Northing	Easting
Cross-section end point		
1A	734770.682	1875860.234
1B	734765.676	1875825.748
2A	734621.348	1875826.406
2B	734610.913	1875782.013
3A	734295.488	1875723.921
3B	734325.640	1875679.006
4A	734172.300	1875721.546
4B	734182.082	1875674.445
5A	734030.805	1875695.028
5B	734052.832	1875648.378
Vegetation plot (0,0) corners		
3	734674.043	1875847.255
4	734474.961	1875761.754
5	734193.568	1875718.263
6	734019.034	1875676.278

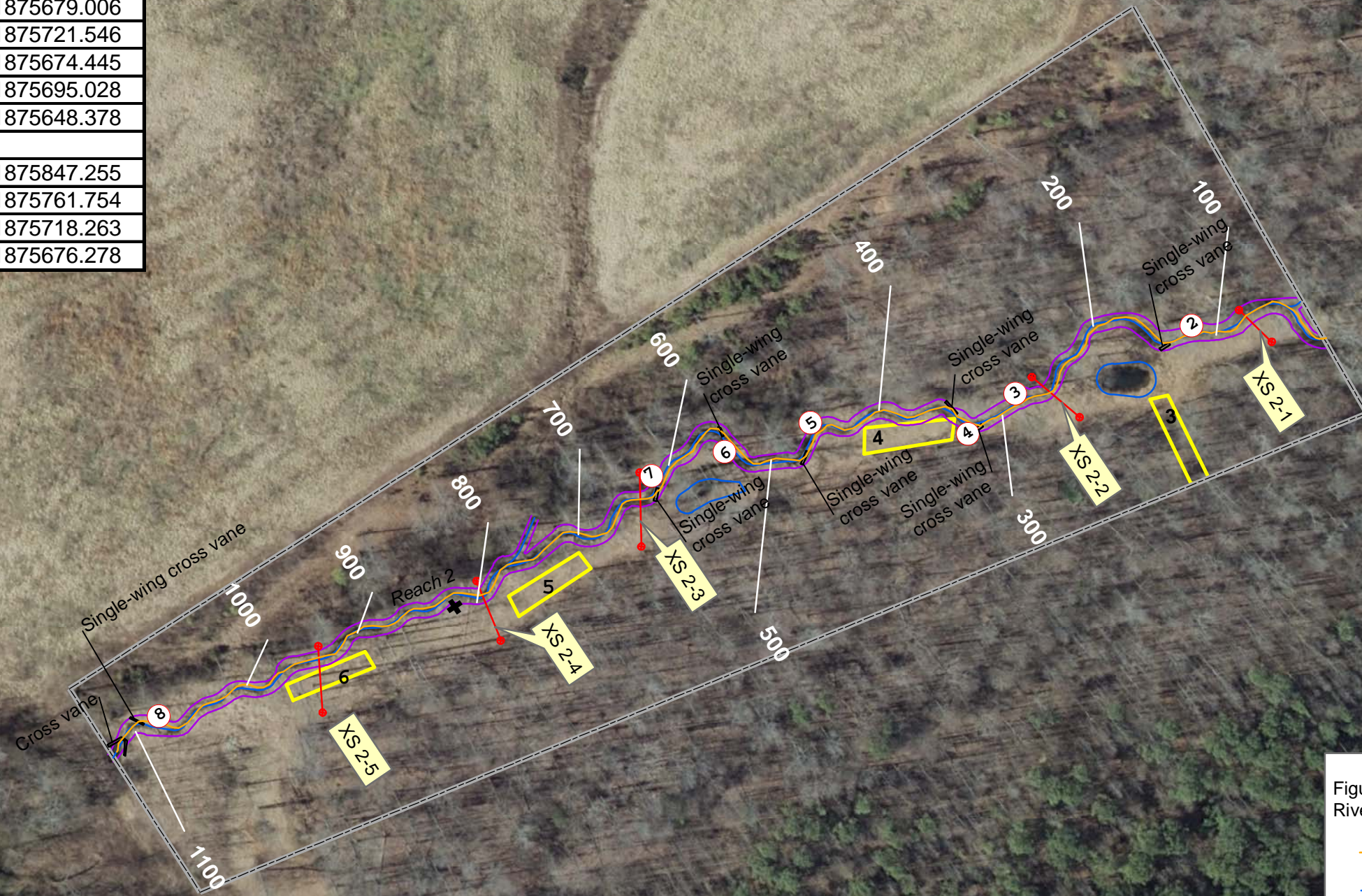
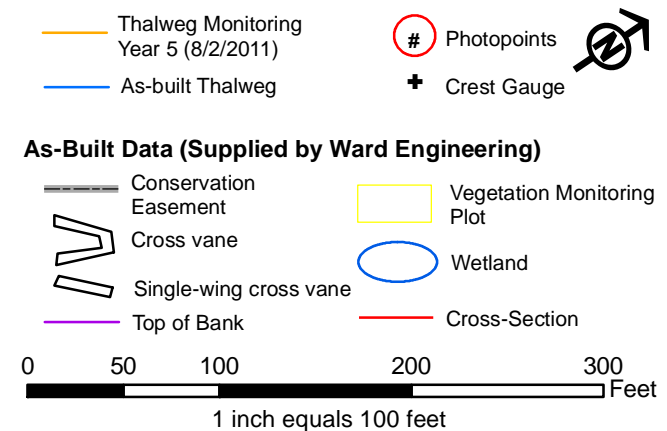


Figure 2.1. Current Conditions Plan View. Rocky River - Reach 2. Chatham County. NCEEP Project #402



UT to Rocky River Stream Restoration – EEP Project #402 MY5 (2011)

Table 5.0

Visual Stream Morphology Stability Assessment

Reach ID

Reach 1

Assessed Length

1095 (reconstructed channel sta 8+87 to 10+95)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	4	4		100%				
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	3	3		100%				
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	3	3		100%				
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	3	3		100%				
		2. Thalweg centering at downstream of meander (Glide)	3	3		100%				
	Totals					0	0			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	1	1		100%				
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	1	1		100%				
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	1		100%				
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	1	1		100%				
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	1	1		100%				

UT to Rocky River Stream Restoration – EEP Project #402 MY5 (2011)

Table 5.1 Visual Stream Morphology Stability Assessment*

Reach ID **Reach 2**
 Assessed Length **1111**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built ⁺	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	30	30			100%			
	3. Meander Pool Condition	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth \geq 1.6)	30	32			94%			
		2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	32	32			100%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	32	32			100%			
		2. Thalweg centering at downstream of meander (Glide)	32	32			100%			
	Totals						0			
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	8	8			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	8	8			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>not</u> exceed 15%. (See guidance for this table in EEP monitoring guidance document)	8	8			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio \geq 1.6 Rootwads/logs providing some cover at base-flow.	6	8			75%			

* Low flow in channel has allowed herbaceous material to become established over the course of the year, making visual assessment difficult.

+As-built data for Section 2 not available. Numbers are based on earlier monitoring year assessments.

Table 6
Planted Acreage¹

Vegetation Condition Assessment
3.4

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage	
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	NA	0	0.00	0.0%	
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1	Lime Green Stippling	2	0.78	22.9%	
				Total	2	0.78	22.9%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	NA	0	0.00	0.0%	
				Cumulative Total	2	0.78	22.9%

Easement Acreage²

9.1

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern ⁴	Areas or points (if too small to render as polygons at map scale).	0.1	NA	0	0.00	0.0%
5. Easement Encroachment Areas ³	Areas or points (if too small to render as polygons at map scale).	none	NA	0	0.00	0.0%

1 = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

2 = The acreage within the easement boundaries.

3 = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1, 2 or 3) as well as a parallel tally in item 5.

4 = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern species are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by EEP such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likely trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly early in a projects monitoring history. However, areas of discrete, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolizing invasives polygons, particularly for situations where the condition for an area is somewhere between isolated specimens and dense, discrete patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

Appendix B. Figure 3.0. Stream Station Photos

Photopoint 1-Reach 1-Station 1110



11/14/2007



8/9/2011

Photopoint 2-Reach 2-Station 110



11/14/2007



8/9/2011

Appendix B. Figure 3.1. Stream Station Photos

Photopoint 3-Reach 2-Station 285



11/14/2007



8/9/2011

Photopoint 4-Reach 2-Station 325



11/14/2007



8/9/2011

Appendix B. Figure 3.2. Stream Station Photos

Photopoint 5-Reach 2-Station 450



11/14/2007



8/9/2011

Photopoint 6-Reach 2-Station 535



11/14/2007



8/9/2011

Appendix B. Figure 3.3. Stream Station Photos

Photopoint 7-Reach 2-Station 610



11/14/2007



8/9/2011

Photopoint 8-Reach 2-Station 1070



11/14/2007



8/9/2011

Appendix B. Figure 4.0. Vegetation Monitoring Plot Photos

Veg Plot 1-Reach 1-Station 1070



10/29/2007



7/28/2011

Veg Plot 2-Reach 1-Station 240



10/29/2007



7/28/2011

Appendix B. Figure 4.1. Vegetation Monitoring Plot Photos

Veg Plot 3-Reach 2-Station 180



11/16/2007



7/28/2011

Veg Plot 4-Reach 2-Station 425



10/29/2007



7/28/2011

Appendix B. Figure 4.2. Vegetation Monitoring Plot Photos

Veg Plot 5-Reach 2-Station 770



10/23/2008



7/29/2011

Veg Plot 6-Reach 2-Station 960



10/30/2007



7/29/2011

Appendix C. Vegetation Plot Data

Table 7.0	Vegetation Plot Mitigation Success Summary Table
Table 8.0	Vegetation Metadata
Table 9.0	Stem Count Total and Planted by Plot and Species
Report	Supplemental Planting Report

<p align="center">Table 7. Vegetation Plot Criteria Attainment UT to Rocky River Stream Restoration - EEP Project #402 MY5 (2011)</p>			
Tract	Vegetation Plot ID	Vegetation Survival Threshold Met	Tract Mean
Reach 1	1	N	0%
	2	N	
Reach 2	3	Y	100%
	4	Y	
	5	Y	
	6	Y	

Table 8. Vegetation Metadata UT to Rocky River Stream Restoration - EEP Project #402 MY5 (2011)	
Report Prepared By	sean doig
Date Prepared	8/22/2011 19:17
database name	402UTtoRR.mdb
database location	D:\Sean\EEP\RockyRiver\11 Monitoring\UTRockyRiver_SmithTract-402-MY5-2011\Support Files\3. Vegetation Plot Data
computer name	JESSIO
file size	34316288

DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----

Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.

PROJECT SUMMARY-----

Project Code	402
project Name	UT to Rocky River (Smith Tract)
Description	stream restoration, enhancement, and preservation
River Basin	Cape Fear
length(ft)	R1: 1,095; R2: 1,111
stream-to-edge width (ft)	R1: 25'-64'; R2: 1'-125'
area (sq m)	R1: 3,830; R2: 4,660
Required Plots (calculated)	6
Sampled Plots	6

Table 9. Planted and Total Stem Counts. UT to Rocky River Stream Restoration - EEP Project #402
Current Plot Data (MY5 2011)

Scientific Name	Plot 1			Plot 2			Plot 3			Plot 4			Plot 5			Plot 6			MY5 (2011)			MY4 (2010)			MY3 (2009)			MY2 (2008)			MY1 (2007)			MY0 (2006)							
	P w/o LS	P-all	T	P w/o LS	P-all	T	P w/o LS	P-all	T	P w/o LS	P-all	T	P w/o LS	P-all	T	P w/o LS	P-all	T	P w/o LS	P-all	T	P w/o LS	P-all	T	P w/o LS	P-all	T	P w/o LS	P-all	T	P w/o LS	P-all	T								
<i>Acer rubrum</i>								2			7								9		10			21						74											
<i>Ailanthus altissima</i>						1													1																						
<i>Albizia julibrissin</i>																															2										
<i>Alnus serrulata</i>															2	2	2	2	2	2	4	4	4	4	4	4	4	4	7	7	7	9	9	9							
<i>Betula nigra</i>									4	4	4	5	5	5				9	9	9	8	8	8	9	9	9	9	9	9	11	11	110	12	12	12						
<i>Carpinus caroliniana</i>						1													1												6	6	6								
<i>Carya</i>			7			1													22																						
<i>Carya alba</i>																																	2								
<i>Carya cordiformis</i>						1	2	2	2									3	2	2	6	6	6	7	3	3	3	7	7	7	23	23	24	28	28	28					
<i>Carya glabra</i>																																		4							
<i>Carya ovata</i>																																									
<i>Celtis laevigata</i>	1	1	1	1	1	1				3	3	3						5	5	5	5	5	6	4	4	4	7	7	7	9	9	10	5	5	5						
<i>Cercis canadensis</i>			8																																8						
<i>Diospyros virginiana</i>																		1																							
<i>Elaeagnus umbellata</i>																																				4					
<i>Fraxinus americana</i>																																									
<i>Fraxinus pennsylvanica</i>	2	2	3			1				3	3	3	5	5	6	1	1	2	11	11	15	13	13	14	13	13	15	14	14	14	17	17	18	16	16	16					
<i>Gleditsia triacanthos</i>						1																																			
<i>Ilex opaca</i>											2																														
<i>Ilex verticillata</i>																2	2	2	2	2	2	2	2	2	4	4	4	4	4	4	5	5	5	6	6	6					
<i>Juglans nigra</i>			1																																	4					
<i>Juniperus virginiana</i>						5																																			
<i>Ligustrum sinense</i>										2																											8				
<i>Lindera benzoin</i>																2	2	2	2	2	2	4	4	5	3	3	3	5	5	5	6	6	6	8	8	8					
<i>Liquidambar styraciflua</i>			1																																		58				
<i>Liriodendron tulipifera</i>							1	1	2	1	1	8	1	1	2				2	3	3	14	3	3	30	4	4	27	2	2	2	8	8	30	15	15	15				
<i>Morus</i>																																					2				
<i>Nyssa sylvatica</i>							1	1	5										1	1	5	2	2	4	1	1	2	2	2	2	6	6	6	6	6	6					
<i>Pinus taeda</i>																																					13				
<i>Platanus occidentalis</i>													2	2	2	1	1	1	3	3	3	3	3	3	3	3	3	5	5	5	6	6	6	7	7	7					
<i>Prunus serotina</i>																																									
<i>Quercus alba</i>							5	5	5										5	5	5	5	5	5	4	4	4	5	5	5	7	7	7	6	6	6					
<i>Quercus coccinea</i>																																						1			
<i>Quercus pagoda</i>	1	1	1										2	2	2				3	3	3	2	2	2	2	2	2	4	4	4	8	8	8	8	8	8					
<i>Quercus phellos</i>	1	1	1										3	3	3	1	1	1	5	5	5	5	5	5	5	5	5	5	5	5	9	9	9	10	10	10					
<i>Quercus rubra</i>																																						2			
<i>Quercus velutina</i>										2	2	2							2	2	2	2	2	2	2	2	2														
<i>Rhus copallinum</i>																																						1			
<i>Rosa multiflora</i>																																						1			
<i>Sambucus canadensis</i>																																							7	7	
<i>Ulmus</i>	1	1	6			5													1	1	36																	23			
<i>Ulmus alata</i>																																							1		
<i>Ulmus americana</i>										3	3	3	1	1	1	2	2	2	6	6	6	6	6	7	7	7	7	7	7	7	6	6	44	7	7	7					
<i>Unknown</i>																																							3		
<i>Viburnum nudum</i>										1	1	1							1	1	1																		2	2	2
Stem count	6	6	29	1	1	19	9	9	60	17	17	90	19	19	62	15	15	52	67	67	312	70	76	360	68	74	321	84	89	89	134	139	479	156	163	163					
size (ACRES)		1			1			1			1			1					6				6				6				6										
Species count	5	5	9	1	1	10	4	4	10	7	7	15	7	7	11	8	8	12	18	18	33	15	16	32	15	16	35	16	17	17	16	17	28	17	18	18					
Stems per ACRE	242.81	242.81	1173.6	40.469	40.469	768.9	364.22	364.22	2428.1	687.97	687.97	3642.2	768.9	768.9	2509.1	607.03	607.03	2104.4	451.9	451.9	2104.4	472.13	512.6	2428.1	458.64	499.11	2165.1	566.56	600.28	600.28	903.8	937.52	3230.7	1052.2	1099.4	1099.4					

WEEKLY INSPECTION REPORT

Date of Inspection: 03-11-2011

Date of Report: 03-14-2011

SCO ID#: 09-0730012 (Axiom Environmental)

Supplemental Planting Oversight for EEP Supplemental Planting 2010-03

Project: **UT Rocky River – EEP #402**

Location: Chatham County, North Carolina

Inspection of: Supplemental Planting 2010-03 (Constr Contract D09116s) (Contract(s))

By: Axiom Environmental, Inc. (Designer)
(Name)

Name & Title of Inspector Phillip H. Perkinson – Project Scientist

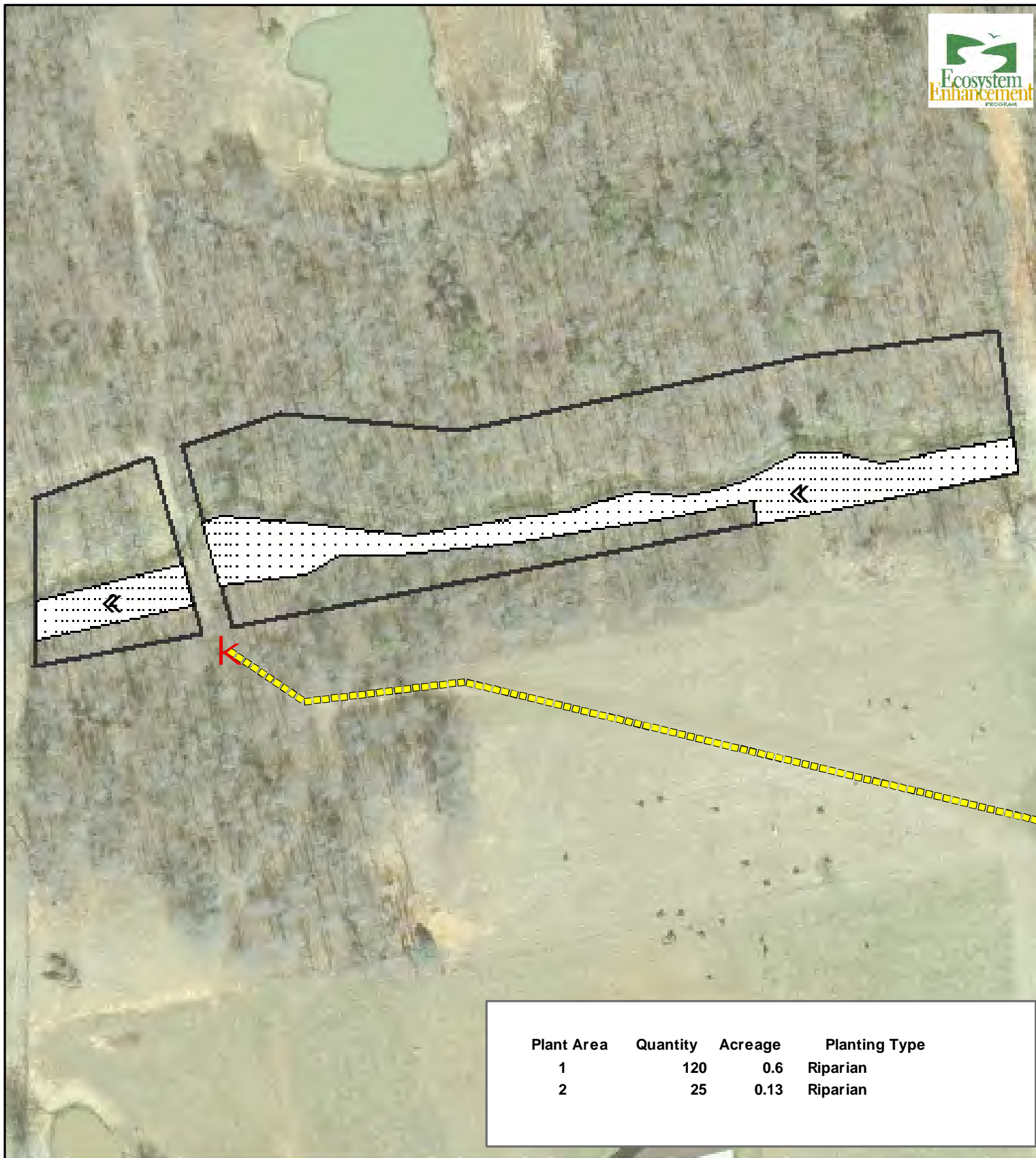
COMMENTS: The UT Rocky Rover supplemental planting was initiated 03-11-2011 and completed 03-11-2011.

Axiom Environmental arrived ahead of planting contractors and walked the planting areas. All plants were staged within the site easement by the contractor (River Works, George Morris) on the day prior to plant installation. No planting areas were flagged due to the small size of planting zones and number of stems being planted. Axiom assisted contractors in the placement of trees to be representative of a natural system. A total of 145 containerized plants were installed at the site. Only the left bank of the stream was planted per mapping provided by the NC EEP. No changes were made in the distribution of stems or planting areas – see attached planting plan.

All stems planted met NC EEP size and vigor requirements. A final walk through was conducted by Axiom Environmental on 03-11-2011, all work was completed as outlined in the bid document.





Species	Quantity Planted	Container Size
Ironwood, <i>Carpinus caroliniana</i>	60	#5
Cherrybark Oak, <i>Quercus pagoda</i>	40	#5
Red Oak, <i>Quercus rubra</i>	20	#5
Arrowwood, <i>Viburnum dentatum</i>	25	#5

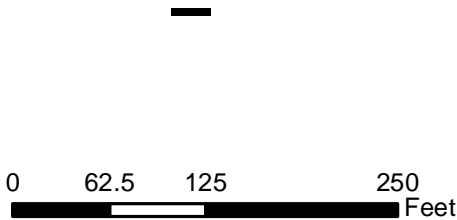
(This report is to be made weekly by the designer and submitted as a part of monthly progress reports.)



Plant Area	Quantity	Acreage	Planting Type
1	120	0.6	Riparian
2	25	0.13	Riparian

Legend

-  Staging Area
-  Site Access
-  2010-03 Planting Areas
-  2010-03 Project Easements



UT Rocky River - EEP #402
Chatham County
PLANTING PLAN
October 2010

EEP Supplemental Planting Species Lists - SP2010-03

(Various Project Sites)

Containerized Plant Measurements - June 2010

Plant Species	Type	Minimum Caliper (inches)	Minimum Height (feet)
Black Cherry	tree	7/16	4.0
Black Willow	tree	11/16	5.5
Carolina Ash 10-gal	tree	3/4	7.0
Cherrybark Oak	tree	3/8	2.5
Green Ash	tree	3/4	7.0
Ironwood	tree	7/16	4.0
Persimmon	tree	5/16	3.5
Red Maple	tree	3/8	3.0
Red Oak	tree	1/2	4.5
River Birch 10-gal	tree	1	7.0
River Birch 5-gal	tree	7/8	6.0
Water Oak	tree	3/8	2.5
White Oak	tree	5/8	3.0
Willow Oak	tree	3/8	3.0
Arrowwood	shrub	3/8	2.5
Button Bush	shrub	1/2	5.0
Elderberry	shrub	1/2	4.5
Red Chokeberry	shrub	3/8	5.0
Silky Dogwood	shrub	5/8	5.0

Appendix D. Stream Survey Data

Figures 5.0-5.5	Cross sections with Annual Overlays
Figures 6.0-6.2	Longitudinal Profiles with Annual Overlays
Figures 7.0-7.5	Pebble Count Plots with Annual Overlays
Tables 10.0-10.1	Baseline Stream Data Summary Table
Table 11.0	Monitoring—Cross-Section Morphology Data Table
Table 11.1-11.2	Monitoring—Stream Reach Morphology Data Table

Figure 5.1. Cross Sections with Annual Overlays - UT to Rocky River Stream Restoration – EEP Project #402

River Basin: Cape Fear
Watershed: UT to Rocky River
XS ID XS 2-1 (Riffle)
Reach: 2
Date: 7/28/2011
Field Crew: SD

SUMMARY DATA

Station	Rod Ht.	Elevation
0	4.50	559.00
6.9	4.91	558.59
11.6	5.09	558.41
17.2	5.17	558.33
20.5	5.95	557.55
24.6	6.49	557.01
25.9	6.64	556.86
26.7	6.91	556.59
27.4	6.91	556.59
28.8	6.08	557.42
31.8	4.93	558.57
35.1	4.60	558.90

Bankfull Width (ft)	14.0
Floodprone Width (ft)	104.0
Bankfull Mean Depth (ft)	0.9
Bankfull Max Depth (ft)	1.7
Bankfull Area (ft ²)	12.8
Bankfull Width/Depth Ratio	15.2
Bankfull Entrenchment Ratio	7.4
Bankfull Bank Height Ratio	1.0
d50 (mm)	0.05



View of XS 2-1 looking downstream

Stream Type: C4

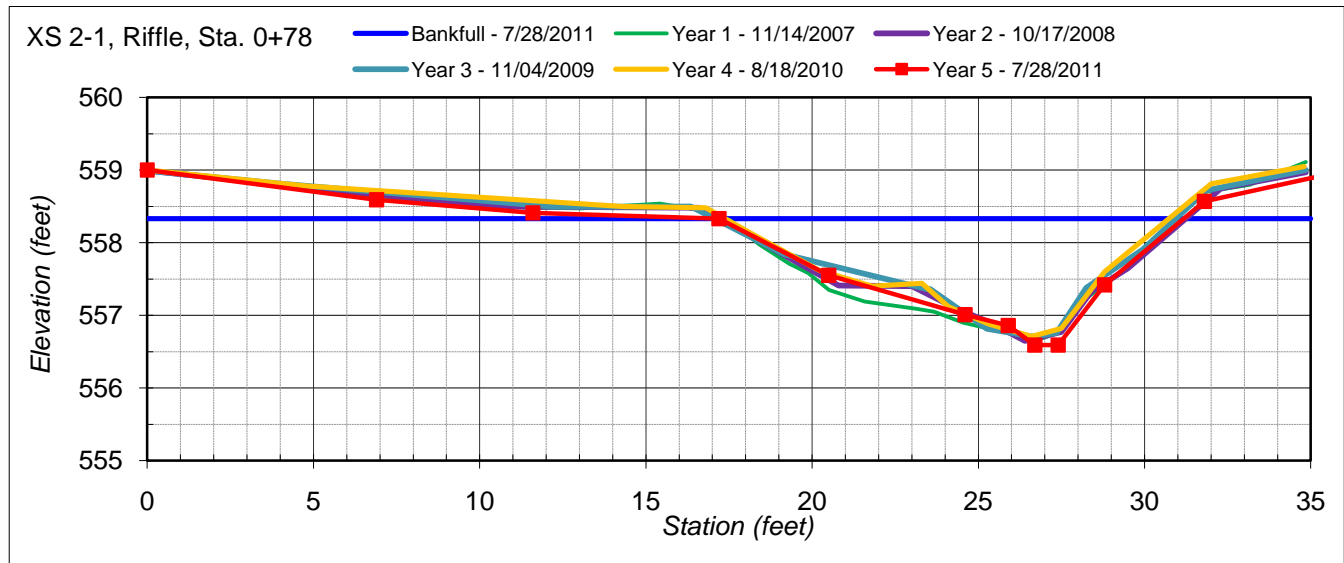


Figure 5.2. Cross Sections with Annual Overlays - UT to Rocky River Stream Restoration – EEP Project #402

River Basin: Cape Fear
Watershed: UT to Rocky River
XS ID XS 2-2 (Pool)
Reach: 2
Date: 7/28/2011
Field Crew: SD

Station	Rod Ht.	Elevation
0	4.35	559.02
10.2	6.22	557.15
15.5	6.66	556.71
22.6	6.96	556.41
25	8.12	555.25
26.3	8.24	555.13
27.8	8.28	555.09
30.4	7.48	555.89
32.7	6.86	556.51
35.5	6.9	556.47
41.8	6.84	556.53
45.6	6.58	556.79

SUMMARY DATA

Bankfull Width (ft)	12.5
Floodprone Width (ft)	112.0
Bankfull Mean Depth (ft)	0.7
Bankfull Max Depth (ft)	1.4
Bankfull Area (ft ²)	8.9
Bankfull Width/Depth Ratio	17.4
Bankfull Entrenchment Ratio	9.0
Bankfull Bank Height Ratio	1.00
d50 (mm)	0.03



View of XS 2-2 looking downstream

Stream Type: C4

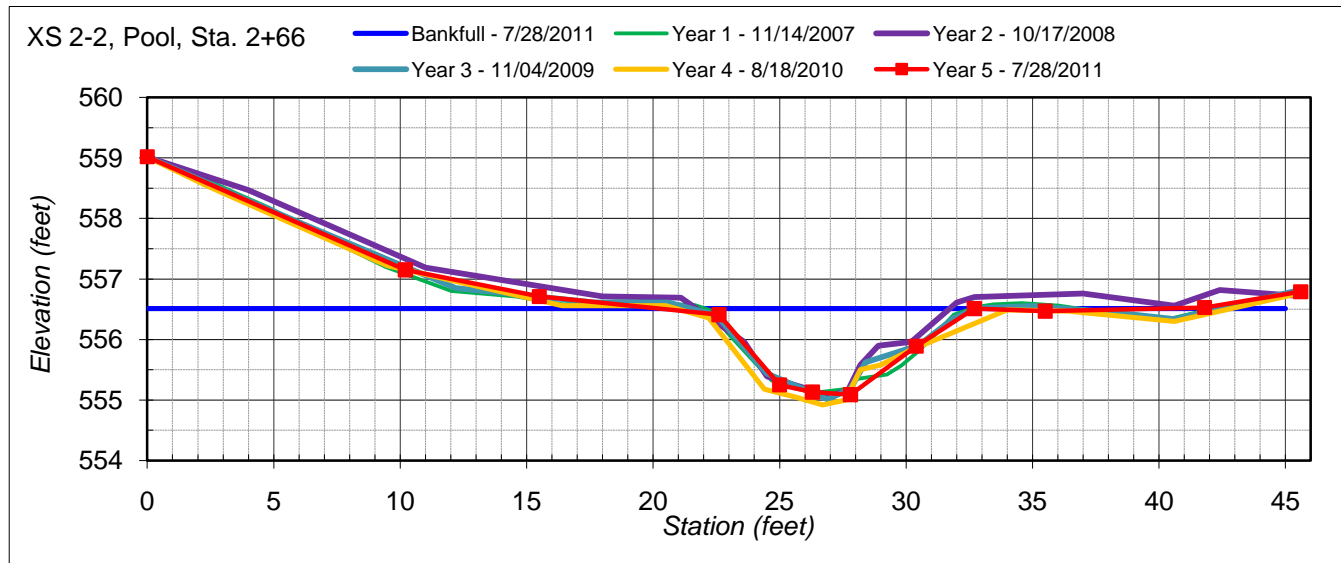


Figure 5.3. Cross Sections with Annual Overlays - UT to Rocky River Stream Restoration – EEP Project #402

River Basin: Cape Fear
Watershed: UT to Rocky River
XS ID XS 2-3 (Riffle)
Reach: 2
Date: 7/28/2011
Field Crew: SD

Station	Rod Ht.	Elevation
0	5.31	552.38
8.2	5.64	552.05
13.3	6.06	551.63
21	6.15	551.54
29.3	6.18	551.51
30.8	6.74	550.95
31.9	6.96	550.73
33.5	7.62	550.07
35.3	7.54	550.15
36.9	6.53	551.16
38.7	6.4	551.29
40.1	5.92	551.77
43.3	5.86	551.83
49.1	5.97	551.72
54.1	5.75	551.94

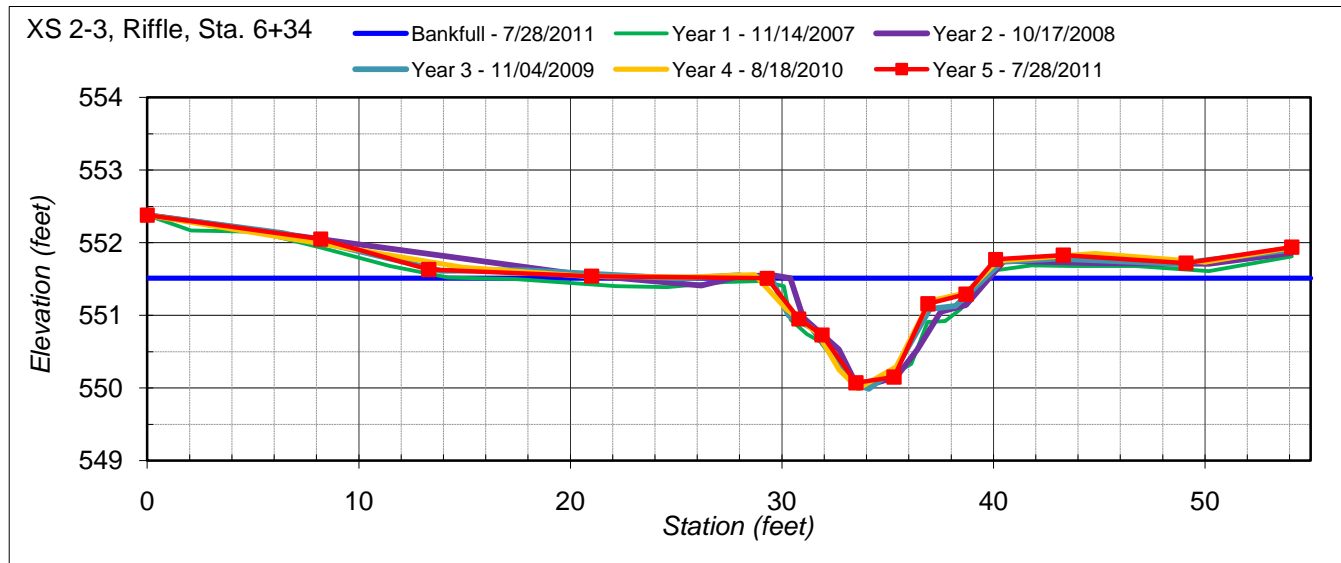
SUMMARY DATA

Bankfull Width (ft)	10.0
Floodprone Width (ft)	200.0
Bankfull Mean Depth (ft)	0.7
Bankfull Max Depth (ft)	1.4
Bankfull Area (ft ²)	7.4
Bankfull Width/Depth Ratio	13.6
Bankfull Entrenchment Ratio	19.9
Bankfull Bank Height Ratio	1.00
d50 (mm)	0.03

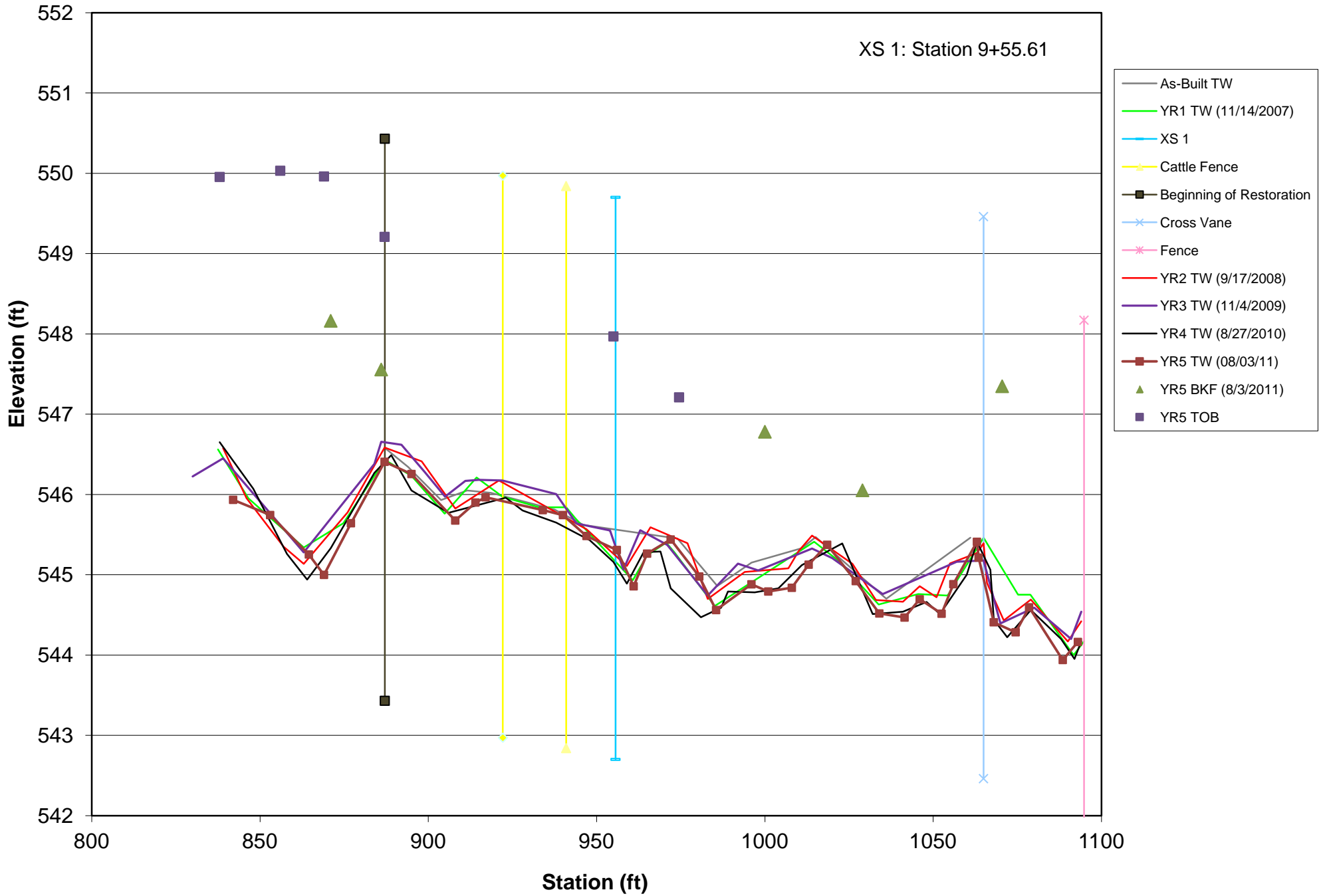


View of XS 2-3 looking downstream

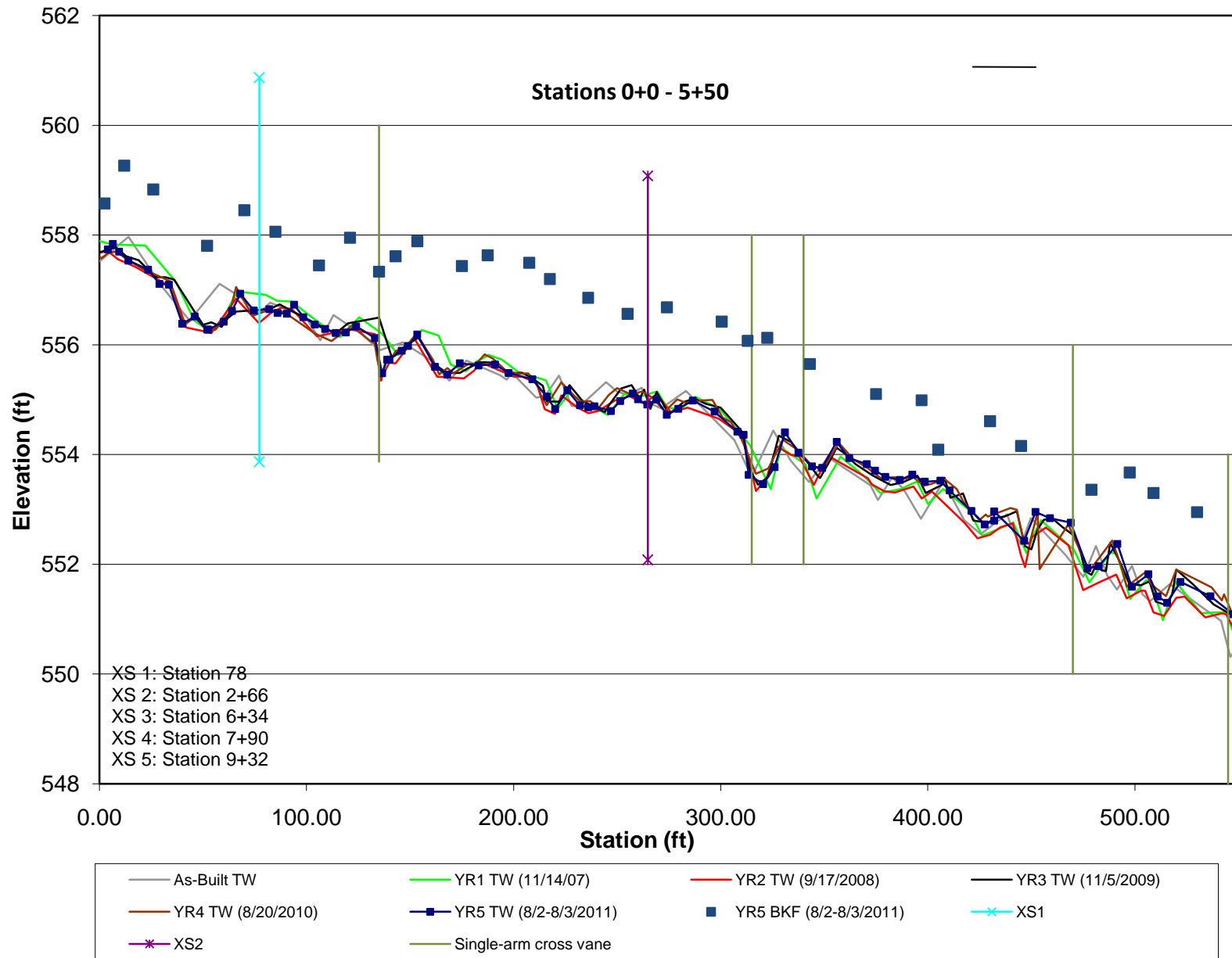
Stream Type: C4



Appendix D. Figure 6.0. Longitudinal Profile with Annual Overlays. Reach 1. UT to Rocky River Stream Restoration - EEP Project #402



Appendix D. Figure 6.1. Longitudinal Profile with Annual Overlays. Reach 2. UT to Rocky River Stream Restoration - EEP Project #402



Appendix D. Figure 6.2. Longitudinal Profile with Annual Overlays. Reach 2. UT to Rocky River Stream Restoration - EEP Project #402

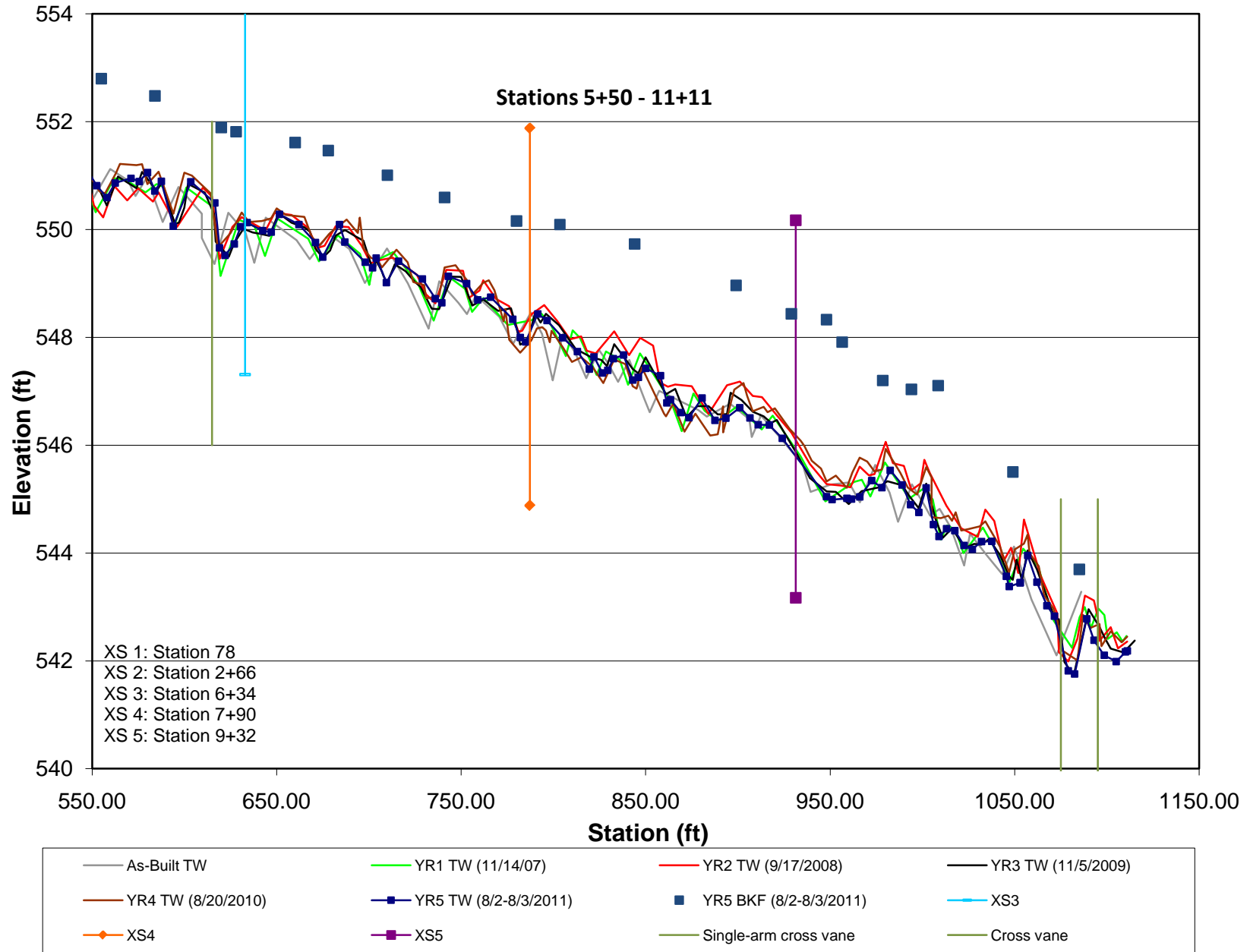


Figure 7.0. Pebble Counts. UT to Rocky River Stream Restoration (EEP Project #402)

XS1-1 (Riffle)			2011		
Descript.	Material	Size (mm)	Total #	Class %	Cum %
Silt/Clay	Silt/Clay	.062	18	19	19
Sand	Very Fine Sand	.125		0	19
	Fine Sand	.25	4	4	23
	Medium Sand	0.5	3	3	26
	Coarse Sand	1.0	1	1	27
	Very Course Sand	2	2	2	29
Gravel	Very Fine Gravel	4.0	2	2	31
	Fine Gravel	5.7	3	3	34
	Fine Gravel	8	9	9	44
	Medium Gravel	11.3	4	4	48
	Medium Gravel	16	5	5	53
	Coarse Gravel	22.6	4	4	57
	Coarse Gravel	32	17	18	75
	Very Course Gravel	45	8	8	83
	Very Course Gravel	64	8	8	92
Cobble	Small Cobble	90	2	2	94
	Small Cobble	128	3	3	97
	Medium Cobble	180	3	3	100
	Large Cobble	256		0	100
Boulder	Small Boulders	362		0	100
	Small Boulders	512		0	100
	Medium Boulders	1024		0	100
	Large Boulders	2048		0	100
Bedrock	Bedrock	40096		0	100
Total			96		

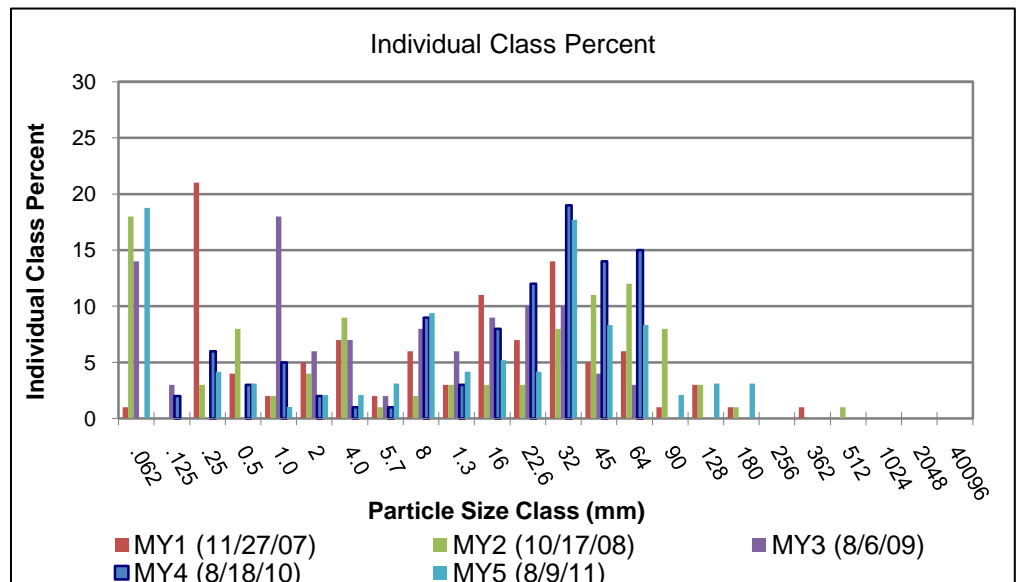
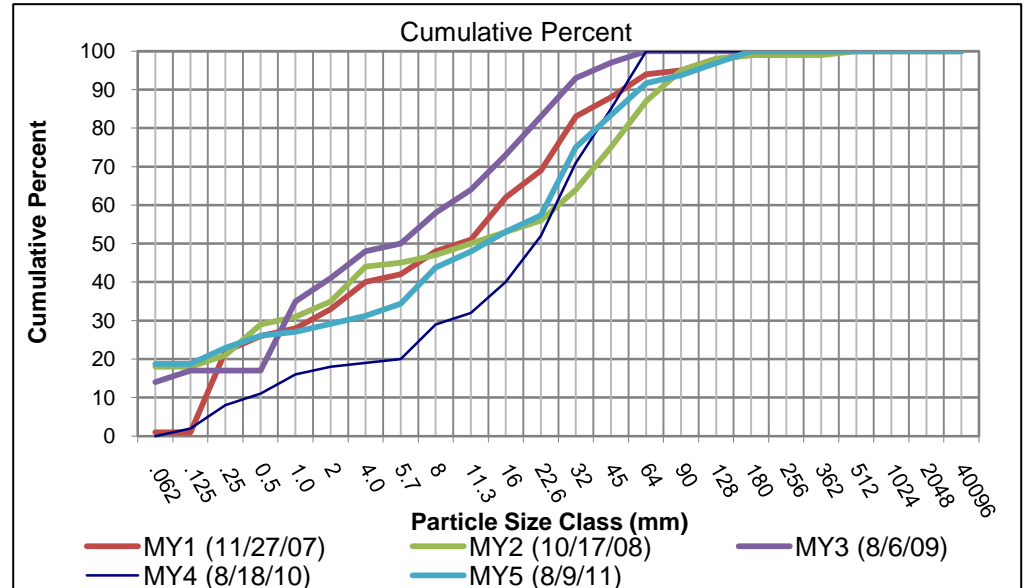


Figure 7.1. Pebble Counts. UT to Rocky River Stream Restoration (EEP Project #402)

XS2-1 (Riffle)			2011		
Descript.	Material	Size (mm)	Total #	Class %	Cum %
Silt/Clay	Silt/Clay	.062	65	67	67
Sand	Very Fine Sand	.125		0	67
	Fine Sand	.25		0	67
	Medium Sand	0.5		0	67
	Coarse Sand	1.0		0	67
	Very Course Sand	2		0	67
Gravel	Very Fine Gravel	4.0		0	67
	Fine Gravel	5.7	1	1	68
	Fine Gravel	8		0	68
	Medium Gravel	11.3		0	68
	Medium Gravel	16	3	3	71
	Coarse Gravel	22.6		0	71
	Coarse Gravel	32	3	3	74
	Very Course Gravel	45	3	3	77
	Very Course Gravel	64		0	77
Cobble	Small Cobble	90	9	9	87
	Small Cobble	128	9	9	96
	Medium Cobble	180	1	1	97
	Large Cobble	256	3	3	100
Boulder	Small Boulders	362		0	100
	Small Boulders	512		0	100
	Medium Boulders	1024		0	100
	Large Boulders	2048		0	100
Bedrock	Bedrock	40096		0	100

Total 97

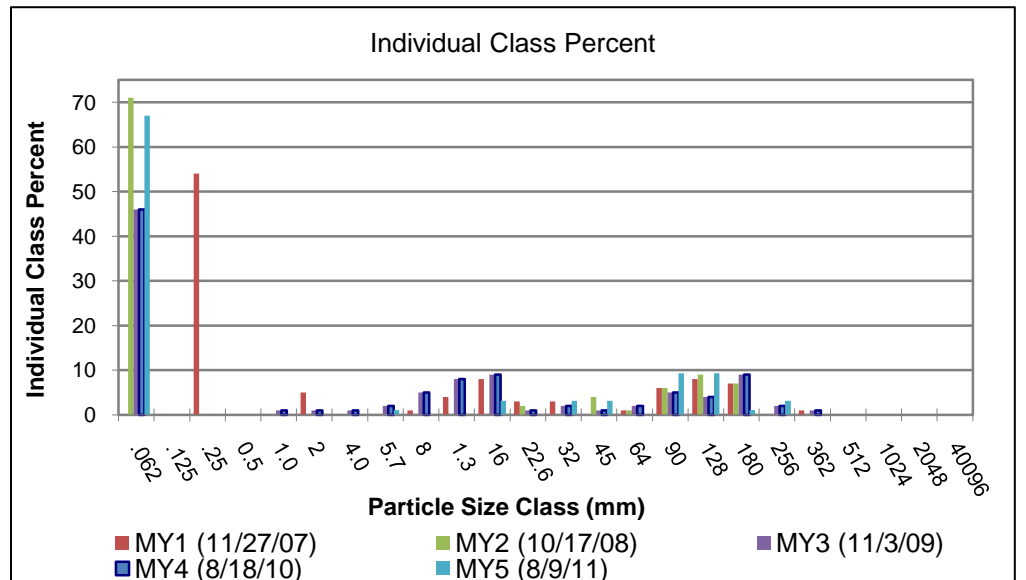
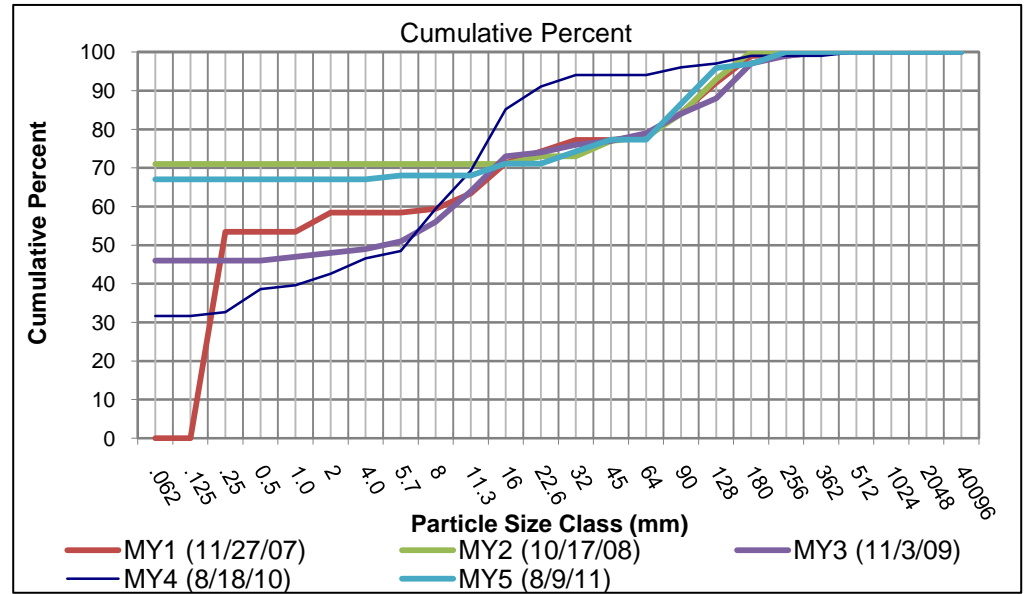


Figure 7.2. Pebble Counts. UT to Rocky River Stream Restoration (EEP Project #402)

XS2-2 (Pool)			2011		
Descript.	Material	Size (mm)	Total #	Class %	Cum %
Silt/Clay	Silt/Clay	.062	96	96	96
Sand	Very Fine Sand	.125		0	96
	Fine Sand	.25		0	96
	Medium Sand	0.5		0	96
	Coarse Sand	1.0		0	96
	Very Course Sand	2		0	96
Gravel	Very Fine Gravel	4.0		0	96
	Fine Gravel	5.7		0	96
	Fine Gravel	8		0	96
	Medium Gravel	11.3	1	1	97
	Medium Gravel	16		0	97
	Coarse Gravel	22.6	1	1	98
	Coarse Gravel	32		0	98
	Very Course Gravel	45	1	1	99
	Very Course Gravel	64	1	1	100
Cobble	Small Cobble	90		0	100
	Small Cobble	128		0	100
	Medium Cobble	180		0	100
	Large Cobble	256		0	100
Boulder	Small Boulders	362		0	100
	Small Boulders	512		0	100
	Medium Boulders	1024		0	100
	Large Boulders	2048		0	100
Bedrock	Bedrock	40096		0	100
Total			100		

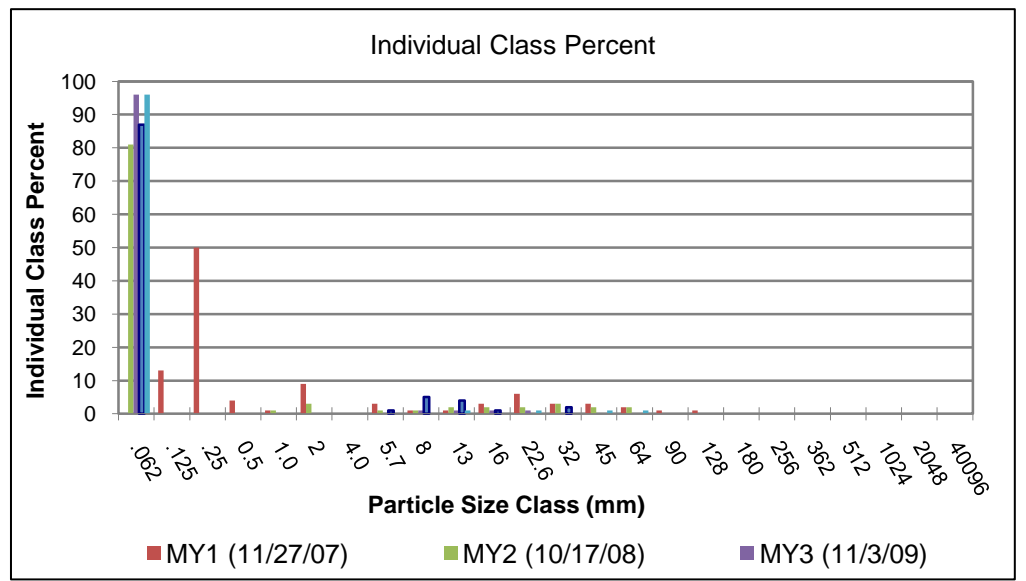
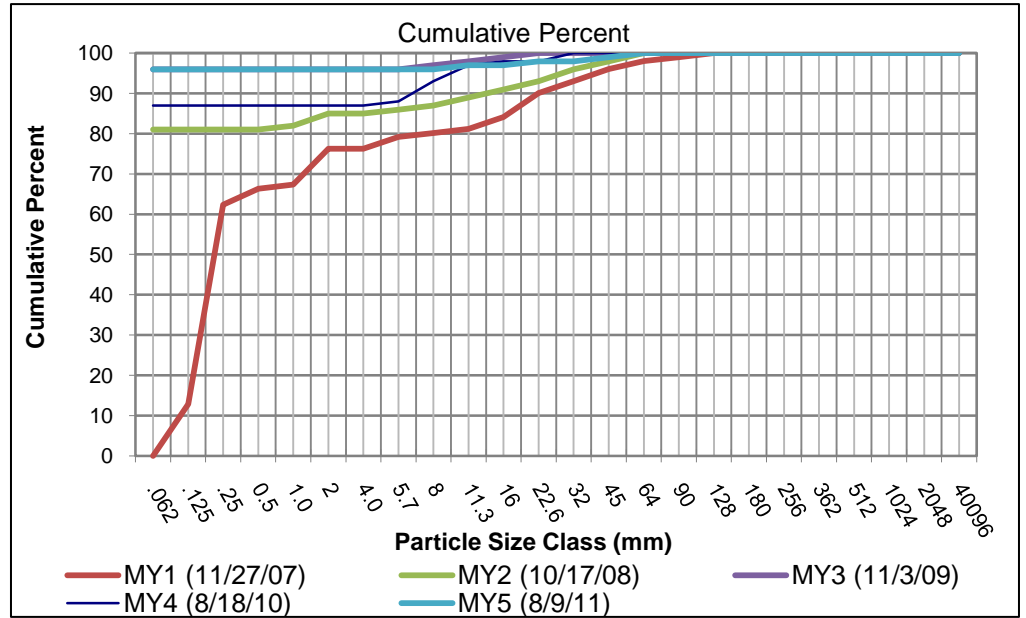


Figure 7.3. Pebble Counts. UT to Rocky River Stream Restoration (EEP Project #402)

XS2-3 (Riffle)			2011		
Descript.	Material	Size (mm)	Total #	Class %	Cum %
Silt/Clay	Silt/Clay	.062	93	91	91
Sand	Very Fine Sand	.125	1	1	92
	Fine Sand	.25	1	1	93
	Medium Sand	0.5		0	93
	Coarse Sand	1.0	1	1	94
	Very Course Sand	2		0	94
Gravel	Very Fine Gravel	4.0	1	1	95
	Fine Gravel	5.7		0	95
	Fine Gravel	8		0	95
	Medium Gravel	11.3		0	95
	Medium Gravel	16	1	1	96
	Coarse Gravel	22.6	1	1	97
	Coarse Gravel	32	1	1	98
	Very Course Gravel	45	2	2	100
	Very Course Gravel	64		0	100
Cobble	Small Cobble	90		0	100
	Small Cobble	128		0	100
	Medium Cobble	180		0	100
	Large Cobble	256		0	100
Boulder	Small Boulders	362		0	100
	Small Boulders	512		0	100
	Medium Boulders	1024		0	100
Bedrock	Bedrock	40096		0	100

Total 102

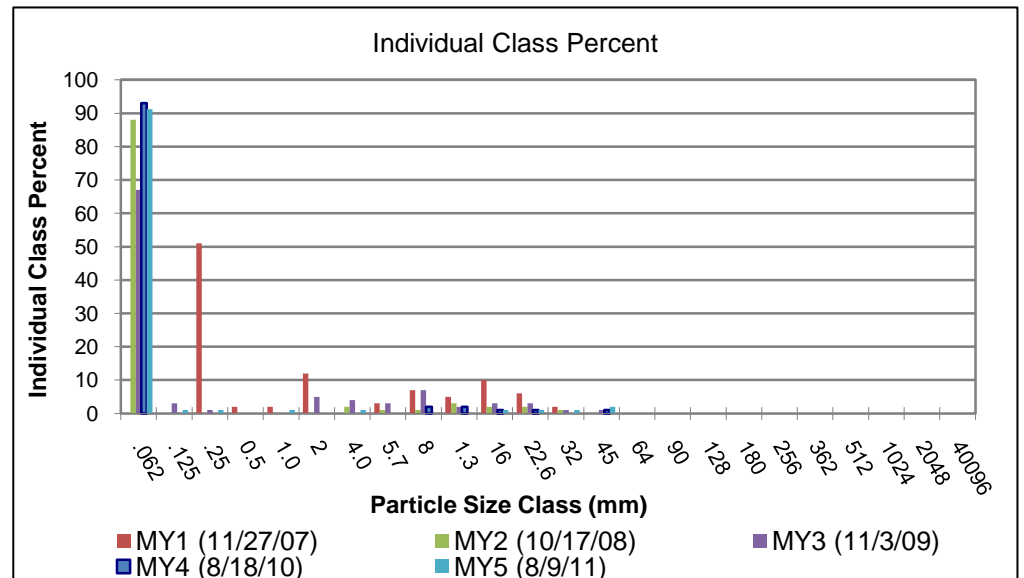
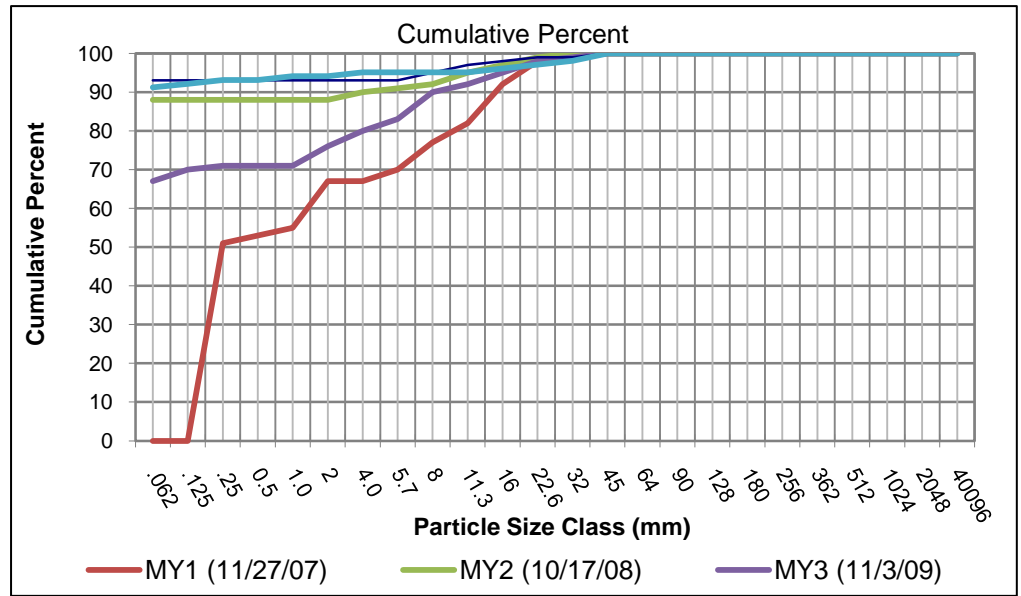


Figure 7.4. Pebble Counts. UT to Rocky River Stream Restoration (EEP Project #402)

XS2-4 (Pool)			2010		
Descript.	Material	Size (mm)	Total #	Class %	Cum %
Silt/Clay	Silt/Clay	.062	86	85	85
Sand	Very Fine Sand	.125		0	85
	Fine Sand	.25		0	85
	Medium Sand	0.5		0	85
	Coarse Sand	1.0		0	85
	Very Course Sand	2		0	85
Gravel	Very Fine Gravel	4.0		0	85
	Fine Gravel	5.7		0	85
	Fine Gravel	8	1	1	86
	Medium Gravel	11.3	5	5	91
	Medium Gravel	16	2	2	93
	Coarse Gravel	22.6	3	3	96
	Coarse Gravel	32	2	2	98
	Very Course Gravel	45		0	98
	Very Course Gravel	64	1	1	99
Cobble	Small Cobble	90		0	99
	Small Cobble	128	1	1	100
	Medium Cobble	180		0	100
	Large Cobble	256		0	100
Boulder	Small Boulders	362		0	100
	Small Boulders	512		0	100
	Medium Boulders	1024		0	100
	Large Boulders	2048		0	100
Bedrock	Bedrock	40096		0	100
Total			101		

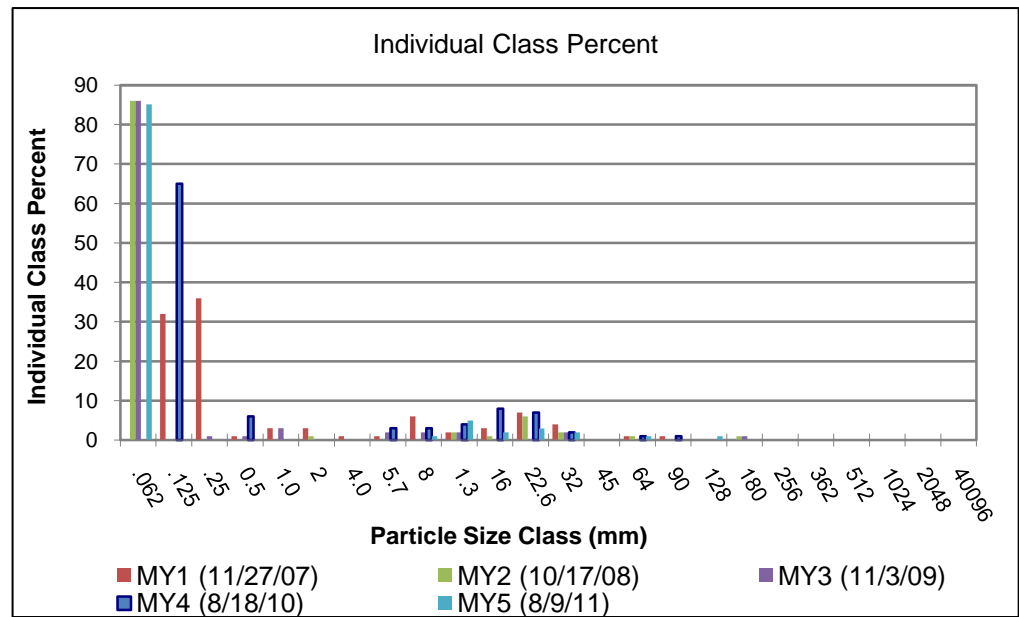
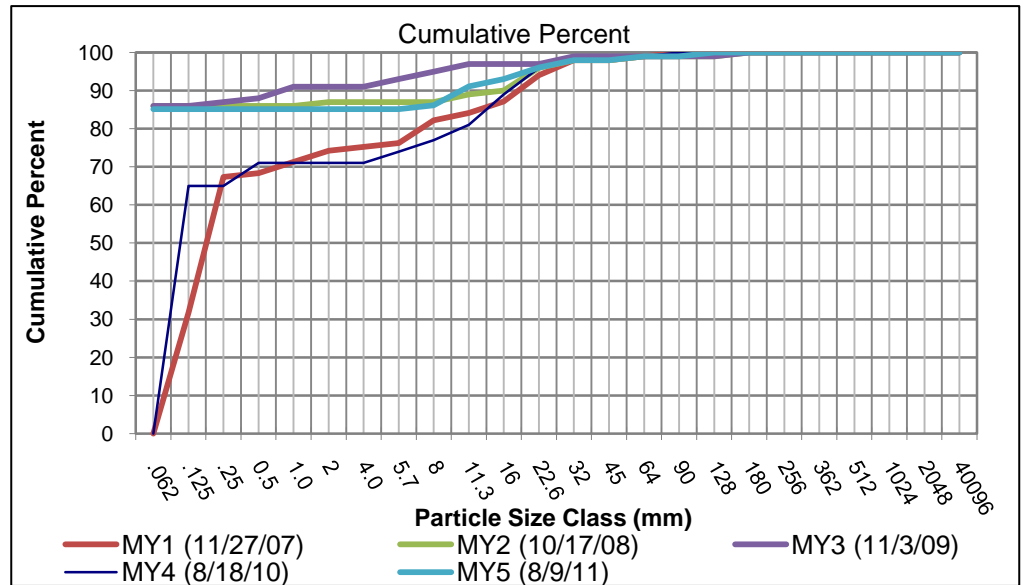


Figure 7.5. Pebble Counts. UT to Rocky River Stream Restoration (EEP Project #402)

XS2-5 (Riffle)			2011		
Descript.	Material	Size (mm)	Total #	Class %	Cum %
Silt/Clay	Silt/Clay	.062	15	15	15
Sand	Very Fine Sand	.125		0	15
	Fine Sand	.25		0	15
	Medium Sand	0.5		0	15
	Coarse Sand	1.0		0	15
	Very Course Sand	2		0	15
Gravel	Very Fine Gravel	4.0		0	15
	Fine Gravel	5.7	4	4	19
	Fine Gravel	8	5	5	24
	Medium Gravel	11.3	6	6	30
	Medium Gravel	16	7	7	37
	Coarse Gravel	22.6	15	15	52
	Coarse Gravel	32	7	7	59
	Very Course Gravel	45	9	9	68
	Very Course Gravel	64	8	8	76
Cobble	Small Cobble	90	4	4	80
	Small Cobble	128	6	6	86
	Medium Cobble	180	1	1	87
	Large Cobble	256	5	5	92
Boulder	Small Boulders	362		0	92
	Small Boulders	512	8	8	100
	Medium Boulders	1024		0	100
	Large Boulders	2048		0	100
Bedrock	Bedrock	40096		0	100
Total			100		

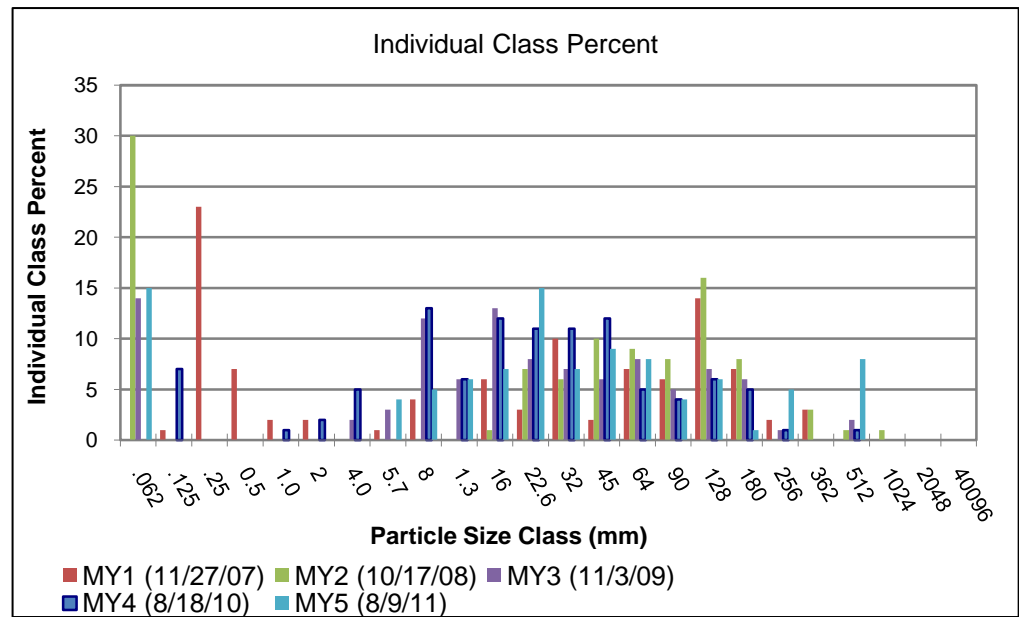
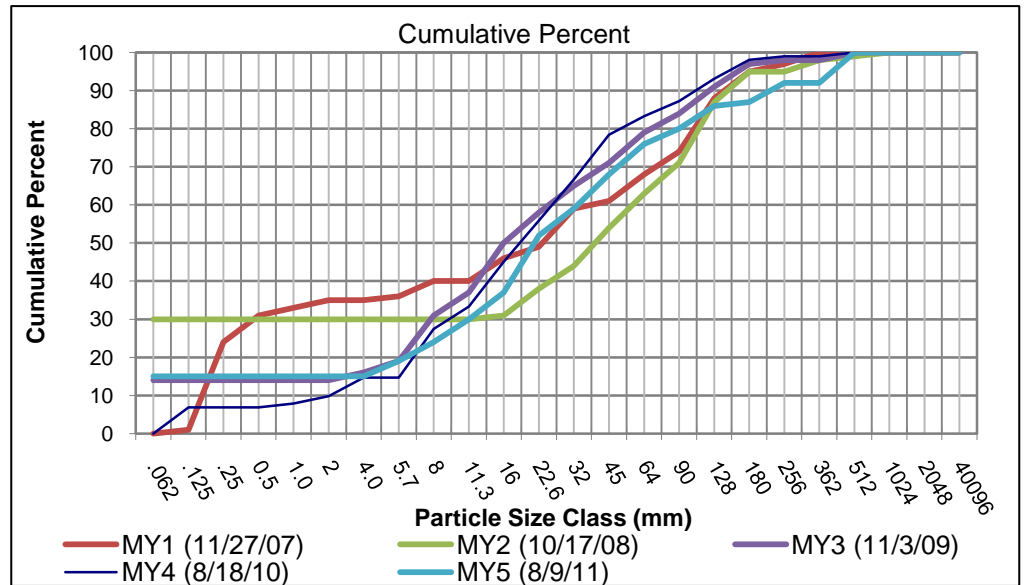


Table 10.0 Baseline Stream Data Summary																									
UT to Rocky River (NCEEP# 402) - Reach 1 (1,095 feet total, Enhancement I length 208 feet Station 8+87 to 10+95)																									
Parameter	Gauge ²	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only+		LL	UL	Eq.	Min	Mean	Med	Max	SD ⁵	n	Min	Mean	Med	Max	SD ⁵	n	Min	Med*	Max	Min	Mean	Med	Max	SD ⁵	n
Bankfull Width (ft)	NA	8.1	28	14	17	--	19.9	22.3	--	--	12.7	--	13.3	13.9	--	--	--	24	--	--	--	24	--	--	--
Floodprone Width (ft)					95	--	153	196	--	--	27	--	35.3	45	--	--	125	140	155	125	--	140	155	--	--
Bankfull Mean Depth (ft)	NA	1.03	2.6	1.6	1.5	--	1.74	2.08	--	--	0.85	--	0.88	0.91	--	--	--	1.6	--	--	--	1.44	-	--	--
¹ Bankfull Max Depth (ft)	NA				2.45	--	2.62	3	--	--	1.26	--	1.34	1.44	--	--	2.3	2.45	2.6	2.3	--	2.8	2.6	--	--
Bankfull Cross Sectional Area (ft ²)	NA	13	50	25	31.4	--	34	36	--	--	11.03	--	11.59	11.95	--	--	38	38.4	53	--	--	34.4	-	--	--
Width/Depth Ratio	NA				8.17	--	11.75	14.87	--	--	14.5	--	15.15	16.35	--	--	--	15	--	--	--	16.6	-	--	--
Entrenchment Ratio	NA				4.8	--	6	7	--	--	2.13	--	2.65	3.24	--	--	5.2	5.8	6.45	5.23	--	5.85	6.48	--	--
¹ Bank Height Ratio	NA				1	--	1.2	1.3	--	--	0.84	--	1.19	1.8	--	--	1	1.1	1.2	1	--	1.15	1.2	--	--
Profile																									
Riffle Length (ft)					8	--	24.5	45	--	--	5	--	15.92	24	--	--	10	30	60	7	--	24	53	--	--
Riffle Slope (ft/ft)					0.003	--	0.015	0.036	--	--	0.0156	--	0.0257	0.149	--	--	0.033	0.034	0.037	0.012	--	0.03	0.032	--	--
Pool Length (ft)					7	--	23	46	--	--	5	--	9.99	19	--	--	19	40	55	19	--	36	50	--	--
Pool Max depth (ft)					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pool Spacing (ft)					26	--	43.7	57.5	--	--	22.8	--	40.3	64	--	--	27	52.6	60	24	--	45.8	60	--	--
Pattern																									
Channel Beltwidth (ft)					40	--	60	80	--	--	15	--	21.7	32	--	--	40	50	70	40	--	50	70	--	--
Radius of Curvature (ft)					15	--	40	70	--	--	11.7	--	21.5	35.9	--	--	55	60	70	55	--	62	70	--	--
Rc:Bankfull width (ft/ft)					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Meander Wavelength (ft)					65	--	112	160	--	--	35	--	45.8	57.5	--	--	100	105	110	100	--	105	110	--	--
Meander Width Ratio					2.35	--	3.01	3.58	--	--	1.13	--	1.63	2.41	--	--	1.6	2	2.9	1.67	--	2.1	2.93	--	--
Transport parameters																									
Reach Shear Stress (competency) lb/f ²								--										--				--			
Max part size (mm) mobilized at bankfull								--										--				--			
Stream Power (transport capacity) W/m ²								--										--				--			
Additional Reach Parameters																									
Rosgen Classification	NA							C4/E4						C4				C4					C4		
Bankfull Velocity (fps)	NA							--										--				--			
Bankfull Discharge (cfs)	NA							--										--				--			
Valley length (ft)								185						312											
Channel Thalweg length (ft)								222						397				208					208		
Sinuosity (ft)								1.2						1.27				1.12					1.12		
Water Surface Slope (Channel) (ft/ft)	NA							0.0088						0.0078				0.0103					0.0093		
BF slope (ft/ft)	NA							0.0103						0.0079				0.0105					0.0105		
³ Bankfull Floodplain Area (acres)								--						--				--				--			
⁴ % of Reach with Eroding Banks								--						--											
Channel Stability or Habitat Metric								--						--											
Biological or Other								--						--											

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing survey data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

* Mean, not median, provided for design numbers. +Numbers provided may not be for riffles only.

Table 10.0 Baseline Stream Data Summary
 UT to Rocky River (NCEEP# 402) - Reach 2 (1,111 feet)

Parameter	Gauge ²	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
		LL	UL	Eq.	Min	Mean	Med	Max	SD ⁵	n	Min	Mean	Med	Max	SD ⁵	n	Min	Med*	Max	Min	Mean	Med	Max	SD ⁵	n
Dimension and Substrate - Riffle Only+																									
Bankfull Width (ft)	NA	3.7	14	7.6	7.7	--	8.13	8.7	--	--	12.7	--	13.3	13.9	--	--	--	11	--	9.89	--	11.15	14.57	--	--
Floodprone Width (ft)					11	--	11.33	12	--	--	27	--	35.3	45	--	--	100	144	200	104	--	141.2	200	--	--
Bankfull Mean Depth (ft)	NA	0.59	1.55	1.02	0.75	--	0.82	0.91	--	--	0.85	--	0.88	0.91	--	--	0.74	0.74	0.84	0.77	--	0.87	1.02	--	--
¹ Bankfull Max Depth (ft)	NA				1.2	--	1.26	1.37	--	--	1.26	--	1.34	1.44	--	--	1.05	1.16	1.33	1.34	--	1.51	1.64	--	--
Bankfull Cross Sectional Area (ft ²)	NA	3.4	15	7.5	6.03	--	6.7	7.04	--	--	11.03	--	11.59	11.95	--	--	8.2	8.2	9.2	8.04	--	9.86	14.87	--	--
Width/Depth Ratio	NA				8.42	--	10	10.94	--	--	14.5	--	15.15	16.35	--	--	13	15	16.35	11.16	--	12.75	14.28	--	--
Entrenchment Ratio	NA				1.26	--	1.4	1.56	--	--	2.13	--	2.65	3.24	--	--	9.9	13	18	7.9	--	13.56	21.85	--	--
¹ Bank Height Ratio	NA				1.46	--	1.66	1.83	--	--	0.84	--	1.02	1.18	--	--	0.84	1.0	1.15	1.0	--	1.04	1.12	--	--
Profile																									
Riffle Length (ft)					4	--	22.78	117.5	--	--	5	--	15.92	24	--	--	4	9.5	26	3	--	9.48	26.3	--	--
Riffle Slope (ft/ft)					0.005	--	0.0305	0.0722	--	--	0.0156	--	0.0257	0.149	--	--	0.02	0.035	0.083	0.012	--	0.033	0.064	--	--
Pool Length (ft)					6	--	9.75	13	--	--	5	--	9.99	19	--	--	13	16.4	27	7.88	--	15.84	29.5	--	--
Pool Max depth (ft)					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pool Spacing (ft)					14	--	40	139	--	--	22.8	--	40.3	64	--	--	17	27.5	51	12.3	--	28	63	--	--
Pattern																									
Channel Beltwidth (ft)					13	--	20	35	--	--	15	--	21.7	32	--	--	12.5	18	26.5	14.3	--	21	35	--	--
Radius of Curvature (ft)					7.6	--	12.3	21.2	--	--	11.7	--	21.5	35.9	--	--	10	13.5	20	10	--	13.8	20	--	--
Rc:Bankfull width (ft/ft)					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Meander Wavelength (ft)					35	--	57	85	--	--	35	--	45.8	57.5	--	--	24	38	65	24	--	37.1	65	--	--
Meander Width Ratio					1.6	--	2.46	4.3	--	--	1.13	--	1.63	2.41	--	--	1.13	1.63	2.41	1.3	--	1.98	2.7	--	--
Transport parameters																									
Reach Shear Stress (competency) lb/ft ²																									
Max part size (mm) mobilized at bankfull																									
Stream Power (transport capacity) W/m ²																									
Additional Reach Parameters																									
Rosgen Classification	NA							G4											C4						
Bankfull Velocity (fps)	NA							--											--						
Bankfull Discharge (cfs)	NA							--											--						
Valley length (ft)								950											312						
Channel Thalweg length (ft)								1011											397						
Sinuosity (ft)								1.06											1.27						
Water Surface Slope (Channel) (ft/ft)	NA							0.015											0.008						
BF slope (ft/ft)	NA							0.014											0.008						
³ Bankfull Floodplain Area (acres)								--											--						
⁴ % of Reach with Eroding Banks								--											--						
Channel Stability or Habitat Metric								--											--						
Biological or Other								--											--						

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing survey data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

* Mean, not median, provided for design numbers. +Numbers provided may not be for riffles only.

Table 11.0. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)**UT to Rocky River (NCEEP# 402) - Reaches 1-2**

	Cross Section 1-1 (Riffle)							Cross Section 2-1 (Riffle)							Cross Section 2-2 (Pool)						
Based on fixed baseline bankfull elevation¹	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	NA	548.3	548.3	548.3	548.3	548.3		NA	559.0	559.0	559.0	559.0	559.0		NA	559.0	559.0	559.0	559.0	559.0	
Bankfull Width (ft)	NA	18.2	18.1	19.2	21.1	18.9		NA	13.2	15.0	15.0	14.3	14.0		NA	9.9	13.2	11.4	12.9	12.5	
Floodprone Width (ft)	NA	157.7	157.0	157.0	157.0	157.0		NA	104.0	104.0	104.0	104.0	104.0		NA	112.0	112.0	112.0	112.0	112.0	
Bankfull Mean Depth (ft)	NA	1.5	1.5	1.5	1.5	1.5		NA	1.0	1.0	0.9	1.0	0.9		NA	0.9	0.7	0.8	0.8	0.7	
Bankfull Max Depth (ft)	NA	2.5	2.6	2.6	2.8	2.5		NA	1.6	1.8	1.8	1.8	1.7		NA	1.4	1.6	1.5	1.6	1.4	
Bankfull Cross Sectional Area (ft ²)	NA	27.8	27.3	29.1	32.6	28.1		NA	12.6	14.8	14.1	13.8	12.8		NA	8.6	9.8	8.5	10.0	8.9	
Bankfull Width/Depth Ratio	NA	11.9	12.0	12.7	13.7	12.8		NA	13.8	15.3	15.9	14.9	15.2		NA	11.5	17.7	15.3	16.6	17.4	
Bankfull Entrenchment Ratio	NA	8.4	8.7	8.2	7.4	8.3		NA	7.9	6.9	6.9	7.3	7.4		NA	11.3	8.5	9.8	8.7	9.0	
Bankfull Bank Height Ratio	NA	1.1	1.1	1.1	1.2	1.1		NA	1.1	1.0	1.0	1.0	1.0		NA	1.0	1.0	1.1	1.0	1.0	
Cross Sectional Area between end pins (ft ²)	NA	71.0	68.4	70.3	56.2	70.3		NA	31.5	29.7	22.0	22.1	29.0		NA	57.2	49.2	56.5	58.3	56.5	
d50 (mm)	NA	10.00	11.30	5.70	21.50	13.18		NA	22.00	0.04	4.85	6.01	0.05		NA	0.18	0.04	0.03	0.04	0.03	
	Cross Section 2-3 (Riffle)							Cross Section 2-4 (Pool)							Cross Section 2-5 (Riffle)						
Based on fixed baseline bankfull elevation¹	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	NA	552.4	552.4	552.4	552.4	552.4		NA	549.8	549.8	549.8	549.8	549.8		NA	547.9	547.9	547.9	547.9	547.9	
Bankfull Width (ft)	NA	9.2	10.3	11.8	10.9	10.0		NA	11.0	10.9	11.3	10.0	10.8		NA	10.6	13.1	12.3	14.6	11.6	
Floodprone Width (ft)	NA	200.0	200.0	200.0	200.0	200.0		NA	160.0	160.0	160.0	160.0	160.0		NA	130.0	130.0	130.0	130.0	130.0	
Bankfull Mean Depth (ft)	NA	0.8	0.8	0.7	0.8	0.7		NA	1.0	1.0	0.9	1.0	1.0		NA	1.0	0.9	0.9	0.9	1.0	
Bankfull Max Depth (ft)	NA	1.3	1.6	1.6	1.6	1.4		NA	1.8	1.8	1.7	1.8	1.8		NA	1.8	2.0	1.9	2.0	1.9	
Bankfull Cross Sectional Area (ft ²)	NA	7.2	8.2	8.3	8.2	7.4		NA	11.0	10.9	10.5	9.8	10.4		NA	10.3	11.3	10.8	12.3	12.0	
Bankfull Width/Depth Ratio	NA	11.7	12.9	16.8	14.4	13.6		NA	11.0	10.9	12.2	10.2	11.2		NA	11.0	15.2	14.1	17.2	11.2	
Bankfull Entrenchment Ratio	NA	21.9	19.4	16.9	18.4	19.9		NA	14.6	14.7	14.2	16.0	14.9		NA	12.2	9.9	10.6	12.3	11.2	
Bankfull Bank Height Ratio	NA	1.0	1.0	1.0	1.0	1.0		NA	1.0	1.0	1.0	1.0	1.0		NA	1.0	1.0	1.0	1.1	1.0	
Cross Sectional Area between end pins (ft ²)	NA	33.1	41.8	20.7	30.7	30.8		NA	17.1	14.1	14.4	12.5	13.0		NA	24.3	21.9	15.9	26.1	23.6	
d50 (mm)	NA	0.25	0.04	0.05	0.03	0.03		NA	0.20	0.04	0.04	0.11	0.04		NA	0.23	39.80	15.00	19.00	21.72	

¹ = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report Additional data from a prior performer is being acquired

**Table 11.1. Monitoring Data - Stream Reach Data Summary
UT to Rocky River (NCEP# 402) - Reach 1 (1,095 feet total, Enhancement I length 208 feet Station 8+87 to 10+95)**

Parameter	Baseline						MY-1						MY-2						MY-3											
	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n						
Dimension and Substrate - Riffle only																														
Bankfull Width (ft)	NA	NA	NA	NA	NA	0	18.2	18.2	18.2	18.2	NA	1	18.1	18.1	18.1	18.1	NA	1	19.2	19.2	19.2	19.2	NA	1	19.2	19.2	19.2	19.2	NA	1
Floodprone Width (ft)	NA	NA	NA	NA	NA	0	157.7	157.7	157.7	157.7	NA	1	157.0	157.0	157.0	157.0	NA	1	157.0	157.0	157.0	157.0	NA	1	157.0	157.0	157.0	157.0	NA	1
Bankfull Mean Depth (ft)	NA	NA	NA	NA	NA	0	1.5	1.5	1.5	1.5	NA	1	1.5	1.5	1.5	1.5	NA	1	1.5	1.5	1.5	1.5	NA	1	1.5	1.5	1.5	1.5	NA	1
¹ Bankfull Max Depth (ft)	NA	NA	NA	NA	NA	0	2.5	2.5	2.5	2.5	NA	1	2.6	2.6	2.6	2.6	NA	1	2.6	2.6	2.6	2.6	NA	1	2.6	2.6	2.6	2.6	NA	1
Bankfull Cross Sectional Area (ft ²)	NA	NA	NA	NA	NA	0	27.8	27.8	27.8	27.8	NA	1	27.3	27.3	27.3	27.3	NA	1	29.1	29.1	29.1	29.1	NA	1	29.1	29.1	29.1	29.1	NA	1
Width/Depth Ratio	NA	NA	NA	NA	NA	0	11.9	11.9	11.9	11.9	NA	1	12.0	12.0	12.0	12.0	NA	1	12.7	12.7	12.7	12.7	NA	1	12.7	12.7	12.7	12.7	NA	1
Entrenchment Ratio	NA	NA	NA	NA	NA	0	8.4	8.4	8.4	8.4	NA	1	8.7	8.7	8.7	8.7	NA	1	8.2	8.2	8.2	8.2	NA	1	8.2	8.2	8.2	8.2	NA	1
¹ Bank Height Ratio	NA	NA	NA	NA	NA	0	1.1	1.1	1.1	1.1	NA	1	1.1	1.1	1.1	1.1	NA	1	1.1	1.1	1.1	1.1	NA	1	1.1	1.1	1.1	1.1	NA	1
Profile																														
Riffle Length (ft)	7	--	24	53	--	--	2.6	6.4	7.4	8.0	2.5	4	11.0	15.0	11.5	26.0	7.4	4	6.0	9.0	7.0	16.0	4.8	4	6.0	9.0	7.0	16.0	4.8	4
Riffle Slope (ft/ft)	0.012	--	0.03	0.032	--	--	0.03	0.03	0.03	0.05	0.01	4	0.02	0.02	0.02	0.03	0.01	4	0.01	0.02	0.02	0.02	0.01	4	0.01	0.02	0.02	0.02	0.01	4
Pool Length (ft)	19	--	36	50	--	--	19.3	31.4	27.5	49.5	12.3	6	19.0	30.8	29.0	48.0	10.4	6	19.0	34.3	37.0	45.0	10.3	6	19.0	34.3	37.0	45.0	10.3	6
Pool Max depth (ft)	--	--	--	--	--	--	--	--	--	--	--	--	1.9	2.4	2.4	2.9	NA	2	2.1	2.6	2.4	3.3	0.5	5	2.1	2.6	2.4	3.3	0.5	5
Pool Spacing (ft)	24	--	45.8	60	--	--	24.4	45.8	48.7	57.9	13.5	5	24.0	45.4	49.0	58.0	12.9	5	25.0	50.0	53.0	74.0	18.1	5	25.0	50.0	53.0	74.0	18.1	5
Pattern																														
Channel Beltwidth (ft)	40	--	50	70	--	--																								
Radius of Curvature (ft)	55	--	62	70	--	--																								
Rc:Bankfull width (ft/ft)	--	--	--	--	--	--																								
Meander Wavelength (ft)	100	--	105	110	--	--																								
Meander Width Ratio	1.67	--	2.1	2.93	--	--																								
Additional Reach Parameters																														
Rosgen Classification	C4						C4						C4						C4											
Channel Thalweg length (ft)	208						207						208						202											
Sinuosity (ft)	1.12						1.12						1.12						1.09											
Water Surface Slope (Channel) (ft/ft)	0.0093						No water in channel at time of survey						0.013						0.0057											
BF slope (ft/ft)	0.01505						0.0093						0.0055						0.0074											
³ Ri% / Ru% / P% / G% / S%	--	--	--	--	--	--	10	4	73	12	0		24	0	73	3	0		14	0	81	5	0		14	0	81	5	0	
³ SC% / Sa% / G% / C% / B% / Be%													18	17	52	12	1	0	14	27	59	0	0	0	14	27	59	0	0	0
³ d16 / d35 / d50 / d84 / d95 /													0.06	2	11.3	59.25	90		0.1	1	5.7	23.54	38.5		0.1	1	5.7	23.54	38.5	
² % of Reach with Eroding Banks	NA						0.0						0.0						0.0											
Channel Stability or Habitat Metric	--						--						--						--											
Biological or Other	--						--						--						--											

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.

2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table

3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave 4. = Of value/needed only if the n exceeds 3

Parameter	MY- 4						MY- 5					
	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n
Dimension and Substrate - Riffle only												
Bankfull Width (ft)	21.1	21.1	21.1	21.1	NA	1	18.9	18.9	18.9	18.9	NA	1
Floodprone Width (ft)	157.0	157.0	157.0	157.0	NA	1	157.0	157.0	157.0	157.0	NA	1
Bankfull Mean Depth (ft)	1.5	1.5	1.5	1.5	NA	1	1.5	1.5	1.5	1.5	NA	1
¹ Bankfull Max Depth (ft)	2.8	2.8	2.8	2.8	NA	1	2.5	2.5	2.5	2.5	NA	1
Bankfull Cross Sectional Area (ft ²)	32.6	32.6	32.6	32.6	NA	1	28.1	28.1	28.1	28.1	NA	1
Width/Depth Ratio	13.7	13.7	13.7	13.7	NA	1	12.8	12.8	12.8	12.8	NA	1
Entrenchment Ratio	7.4	7.4	7.4	7.4	NA	1	8.3	8.3	8.3	8.3	NA	1
¹ Bank Height Ratio	1.2	1.2	1.2	1.2	NA	1	1.1	1.1	1.1	1.1	NA	1
Profile												
Riffle Length (ft)	6.0	13.0	10.5	25.0	8.4	4	8	18.13	12.75	39	14.27	4
Riffle Slope (ft/ft)	0.02	0.07	0.06	0.15	0.06	4	0.017	0.039	0.037	0.065	0.025	3
Pool Length (ft)	12.0	27.8	28.0	46.0	14.2	6	9	20.58	20.5	34	8.44	6
Pool Max depth (ft)	1.9	2.6	2.9	3.5	0.7	5	1.5	2.5	2.6	3.2	0.67	6
Pool Spacing (ft)	16.0	40.8	42.0	71.0	22.5	5	24.5	41.1	39	56	13.32	5
Pattern												
Channel Beltwidth (ft)												
Radius of Curvature (ft)												
Rc:Bankfull width (ft/ft)												
Meander Wavelength (ft)												
Meander Width Ratio												
Additional Reach Parameters												
Rosgen Classification	C4						C4					
Channel Thalweg length (ft)	205						211					
Sinuosity (ft)	1.11						1.14					
Water Surface Slope (Channel) (ft/ft)	No water in channel at time of survey						No water in channel at time of survey					
BF slope (ft/ft)	0.0048						0.0041					
³ Ri% / Ru% / P% / G% / S%	20	8	56	16	0							
³ SC% / Sa% / G% / C% / B% / Be%	0	18	82	0	0	0	19	10	63	8	0	0
³ d16 / d35 / d50 / d84 / d95 /	1	13.05	21.5	44.07	57.67		0.05	5.85	13.18	46.53	105.2	
² % of Reach with Eroding Banks	0.0						0					
Channel Stability or Habitat Metric	--						--					
Biological or Other	--						--					

Table 11.1. Monitoring Data - Stream Reach Data Summary UT to Rocky River (NCEEP# 402) - Reach 2 (1,111 feet)																								
Parameter	Baseline						MY-1						MY-2						MY-3					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n
Bankfull Width (ft)	NA	NA	NA	NA	NA	0	9.2	11.0	10.6	13.2	NA	3	10.3	12.8	13.1	15.0	NA	3	11.8	13.0	12.3	15.0	NA	3
Floodprone Width (ft)	NA	NA	NA	NA	NA	0	104	145	130	200	NA	3	104	145	130	200.0	NA	3	104	145	130	200.0	NA	3
Bankfull Mean Depth (ft)	NA	NA	NA	NA	NA	0	0.8	0.9	1.0	1.0	NA	3	0.8	0.9	0.9	1.0	NA	3	0.7	0.8	0.9	0.9	NA	3
¹ Bankfull Max Depth (ft)	NA	NA	NA	NA	NA	0	1.3	1.6	1.6	1.8	NA	3	1.6	1.8	1.8	2.0	NA	3	1.6	1.7	1.8	1.9	NA	3
Bankfull Cross Sectional Area (ft ²)	NA	NA	NA	NA	NA	0	7.2	10.0	10.3	12.6	NA	3	8.2	11.4	11.3	14.8	NA	3	8.3	11.1	10.8	14.1	NA	3
Width/Depth Ratio	NA	NA	NA	NA	NA	0	11.0	12.2	11.7	13.8	NA	3	12.9	14.5	15.2	15.3	NA	3	14.1	15.6	15.9	16.8	NA	3
Entrenchment Ratio	NA	NA	NA	NA	NA	0	7.9	14.0	12.2	21.9	NA	3	6.9	12.1	9.9	19.4	NA	3	6.9	11.5	10.6	16.9	NA	3
¹ Bank Height Ratio	NA	NA	NA	NA	NA	0	1.0	1.0	1.0	1.1	NA	3	1.0	1.0	1.0	1.0	NA	3	1.0	1.0	1.0	1.0	NA	3
Profile																								
Riffle Length (ft)	3	--	9.48	26.3	--	--	2.66	10.7	11	27.6	5.9	35	5.0	13.7	11.0	32.0	7.6	25	5.0	15.0	11.0	43.0	9.2	29
Riffle Slope (ft/ft)	0.012	--	0.033	0.064	--	--	0	0.03	0.03	0.06	0.02	35	-0.02	0.03	0.03	0.11	0.02	25	0.002	0.013	0.014	0.023	0.006	28
Pool Length (ft)	7.88	--	15.84	29.5	--	--	9.7	18.7	15	47.8	10.1	26	8.0	20.1	17.5	51.0	9.7	28	13.0	18.7	17.0	30.0	5.2	30
Pool Max depth (ft)	--	--	--	--	--	--	--	--	--	--	--	--	2.0	2.5	2.5	3.5	0.4	21	1.7	2.3	2.2	3.1	0.4	20
Pool Spacing (ft)	12.3	--	28	63	--	--	15.9	42.9	34	124.2	26.7	25	13.0	40.4	29.0	84.0	22.4	27	12.0	38.1	31.0	109.0	20.9	29
Pattern																								
Channel Beltwidth (ft)	14.3	--	21	35	--	--																		
Radius of Curvature (ft)	10	--	13.8	20	--	--							Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline											
Rc:Bankfull width (ft/ft)	--	--	--	--	--	--																		
Meander Wavelength (ft)	24	--	37.1	65	--	--																		
Meander Width Ratio	1.3	--	1.98	2.7	--	--																		
Additional Reach Parameters																								
Rosgen Classification	C4						C4						C4						C4					
Channel Thalweg length (ft)	1111						1200						1111						1112					
Sinuosity (ft)	1.2						1.17						1.17						1.17					
Water Surface Slope (Channel) (ft/ft)	No water in channel at time of survey						No water in the channel at time of survey.						No water in the channel at time of survey.						No water in the channel at time of survey.					
BF slope (ft/ft)	0.009 (upper portion); 0.014 (lower portion)						0.009 (upper portion); 0.014 (lower portion)						0.014						0.013					
³ Ri% / Ru% / P% / G% / S%	NA	NA	NA	NA	NA		34	DK	44	DK	0		31	DK	51	DK	0		38	9	47	6	0	
³ SC% / Sa% / G% / C% / B% / Be%													64	0.9	14.1	16.5	4.5	0	58.1	3	24.9	12.6	1.4	0
³ d16 / d35 / d50 / d84 / d95 /													0.01	4	8	42.5	76.9		0.8	2.1	4.2	37.2	71	
² % of Reach with Eroding Banks	NA						0.0						0.0						0.0					
Channel Stability or Habitat Metric	--						--						--						--					
Biological or Other	--						--						--						--					

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.

2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table

3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave

Parameter	MY- 4						MY- 5					
	Min	Mean	Med	Max	SD ⁴	n	Min	Mean	Med	Max	SD ⁴	n
Dimension and Substrate - Riffle only												
Bankfull Width (ft)	10.9	13.3	14.3	14.6	NA	3	10.0	11.9	11.6	14.0	NA	3
Floodprone Width (ft)	104	145	130	200	NA	3	104	145	130	200	NA	3
Bankfull Mean Depth (ft)	0.8	0.9	0.9	1.0	NA	3	0.7	0.9	0.9	1.0	NA	3
¹ Bankfull Max Depth (ft)	1.6	1.8	1.8	2.0	NA	3	1.4	1.7	1.7	1.9	NA	3
Bankfull Cross Sectional Area (ft ²)	8.2	11.4	12.3	13.8	NA	3	7.4	10.8	12.0	12.8	NA	3
Width/Depth Ratio	14.4	15.5	14.9	17.2	NA	3	11.2	13.3	13.6	15.2	NA	3
Entrenchment Ratio	7.3	12.7	12.3	18.4	NA	3	7.4	12.9	11.2	19.9	NA	3
¹ Bank Height Ratio	1.0	1.0	1.0	1.1	NA	3	1.0	1.0	1.0	1.0	NA	3
Profile												
Riffle Length (ft)	3.0	11.6	8.5	26.0	7.2	30	4	13.7	11.3	47	9.5	30
Riffle Slope (ft/ft)	0.01	0.04	0.04	0.11	0.02	30	0.01	0.04	0.03	0.17	0.03	30
Pool Length (ft)	6.0	16.4	15.5	43.0	7.3	32	7	15.3	14.8	26.5	4.3	32
Pool Max depth (ft)	1.3	2.2	2.1	3.2	0.4	27	1.7	2.1	2.1	2.8	0.4	29
Pool Spacing (ft)	5.0	35.6	32.0	80.0	18.9	31	7	34	30.5	90.5	18.4	31
Pattern												
Channel Beltwidth (ft)												
Radius of Curvature (ft)												
Rc:Bankfull width (ft/ft)												
Meander Wavelength (ft)												
Meander Width Ratio												
Additional Reach Parameters												
Rosgen Classification	C4						C4					
Channel Thalweg length (ft)	1119						1115					
Sinuosity (ft)	1.18						1.17					
Water Surface Slope (Channel) (ft/ft)	No water in the channel at time of survey.						No water in the channel at time of survey.					
BF slope (ft/ft)	0.014						0.013					
³ Ri% / Ru% / P% / G% / S%	41	4	48	7	0		42	7	48	3	0	
³ SC% / Sa% / G% / C% / B% / Be%	41	18	34	6	1	0	71	1	19	8	2	0
³ d16 / d35 / d50 / d84 / d95 /	1.2	2.5	5	19.5	52.7		0.9	3	4.4	39.6	113.4	
² % of Reach with Eroding Banks	0.0						0					
Channel Stability or Habitat Metric	--						--					
Biological or Other	--						--					

Appendix E. Hydrologic Data

Table 12.0 Verification of Bankfull Events

Table 12.0. Bankfull Verification UT to Rocky River (NCEEP# 402)			
Date of Data Collection	Date of Occurrence	Method	Photo # (if available)
14-Apr-08	March 5, 2008, April 5, 2008	Crest gauge evaluation, presence of wrack and drift lines, evaluation of NC CRONOS data	NA
17-Oct-08	August 27, 2008, September 6, 2008	Crest gauge evaluation, presence of wrack and drift lines, evaluation of NC CRONOS data	NA
12-Mar-09	December 11-12, 2008, January 6, 2009, March 2, 2009	Crest gauge evaluation, presence of wrack and drift lines, evaluation of NC CRONOS data	NA
17-Mar-10	November 11, 2009 (2.34"), December 2, 2009 (1.73") and February 5, 2010 (1.94").	Presence of wrack and drift lines, evaluation of NC CRONOS data	NA
21-Oct-10	September 30, 2010 (2.87")	Crest gauge evaluation, presence of wrack and drift lines, evaluation of NC CRONOS data	NA